IN THIS ISSUE: Electric Welding Aids Western Industry

JOURNAL OF ELECTRICITY

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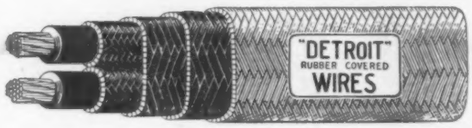

JOURNAL OF ELECTRICITY

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ROBERT SIBLEY, Editor — H. W. L. GARDINER, Business Manager

VOLUME 45 — SAN FRANCISCO, DECEMBER 1, 1920 — NUMBER 11

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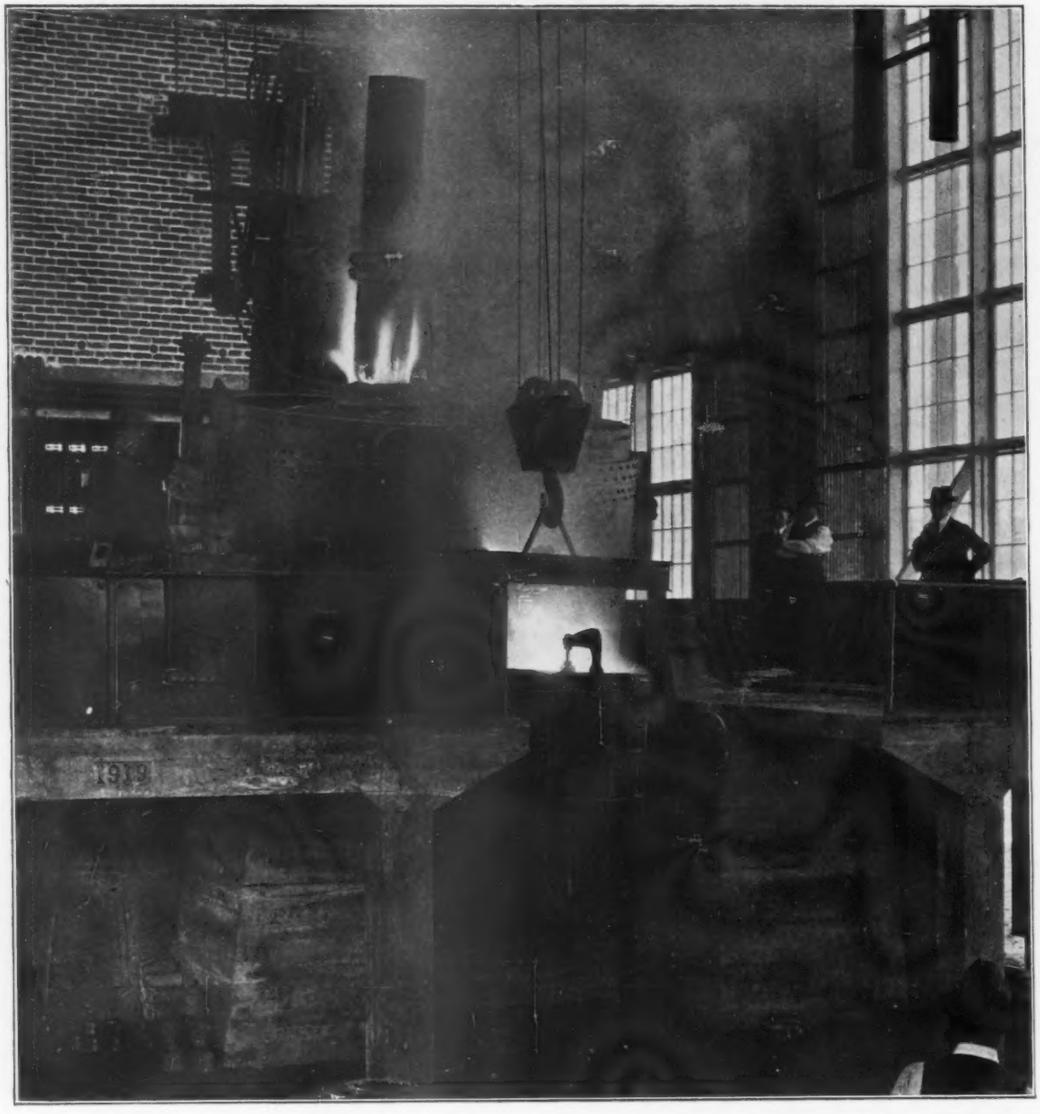

A Growing Factor in Western Industrial Development

TO DATE it is possible to count the installations of electric furnaces west of the Rocky Mountains, but the advantages alike to the power company in the large blocks of power involved, and to the user in the purity and cheapness of the resulting product are beginning to be felt in the mounting interest shown in this field. The furnace here shown is of the 6-ton Heroult type in successful operation in the shops of the Southern Pacific Company at Sacramento, California. The satisfactory record of steel thus produced during the first month at 4½c. per lb. including all overhead and with high prices on material, at the same time maintaining a very high quality of output, compares most favorably with other methods of steel production. Steel furnaces utilizing iron scrap rather than pig iron on which high freight rates must be paid, are the natural development for the West and there are tremendous possibilities in Western metal industries along this line.

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JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 45 | SAN FRANCISCO, DECEMBER 1, 1920 | Number 11

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THE NEED OF CONFIDENCE

THE confidence of the people of the West in their public utilities must not be shaken. These servant industries of the people have construction plans that run into the hundreds of millions of dollars to be expended in the next few years, and upon the carrying out to successful completion of these plans depends the industrial upbuilding of the West. This point was brought out in a recent speech by E. O. Edgerton, president of the California State Railroad Commission, before the League of California Municipalities in which he said, "It must be clearly understood that if California is to progress industrially, there must be an immense increase in the facilities of the companies performing public utility service. Expressed in terms of money, it will mean several hundred million dollars in the next few years. It must be admitted that there is no power to force investment in the securities of these companies, and sound policy becomes of vital importance in an assurance to the investor that his investment will be dealt with fairly and intelligently, else he will refuse to come in, and progress in the development of California will be seriously retarded. . . . You who are the official representatives of municipalities have a very serious responsibility. It is your obligation when you advise your constituents on public utility matters not only to state the facts as you are informed, but that you fully inform yourselves before attempting to speak. It is important that you do not by misstatement, either purposely or ignorantly, shake the confidence of the public in so important a matter as the regulation of public utilities."

It must be admitted that there are advocates of public ownership who misrepresent the facts concerning the operation of publicly owned and privately owned public utilities so that the epithets of "grafting" and "soulless" have in the past been applied to the public corporations. Years ago these epithets may have held true, but in this day of commission regulation and a determined effort on the part of the public utilities to render service with their commodity, such a thing can not exist.

The great industries of the West of which the power companies are an important part must not be held back in their program of construction, and for that reason the electrical industry as a whole must present a solid front against these attacks, keep the confidence of the people in these power companies so they will be willing to support them financially in carrying on their development of natural resources, thus insuring the industrial progress of the West.

Service Policies on Electric Ranges

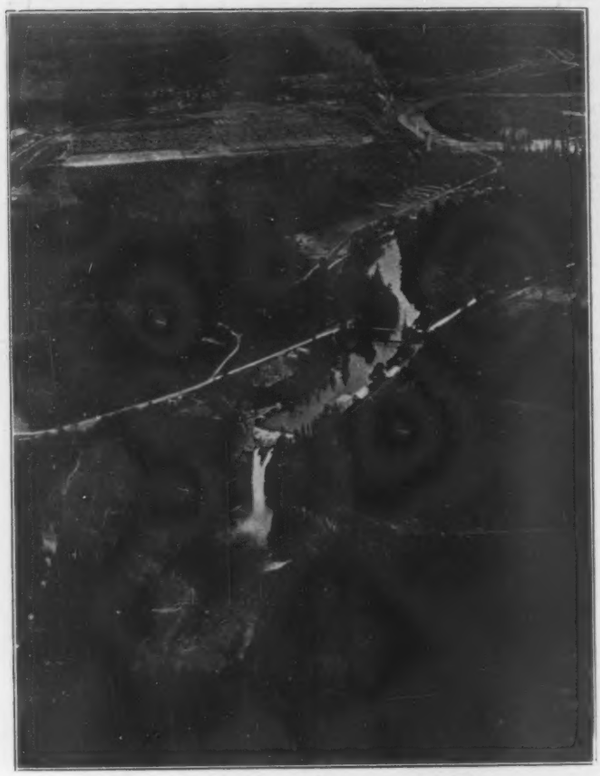
With renewed interest in electric ranges as one of the elements of the relieved power shortage, the question of a service policy in this field is again to the fore. That the power company should give service on this equipment is unquestioned, but there is a tendency at present to take the stand that the customer should be asked to pay the cost of replacements where these are not excessive or do not spring from defective parts. Experience of some of the Western companies has been that such bills, if dictated by a not unliberal policy, are met with perfect willingness on the part of the consumer, who has not expected to get more than he pays for. The necessity for some such charge is obvious when the problem comes up of what shall be done for a consumer who moves into a territory with a range already purchased elsewhere and requests service, a situation which is becoming more and more frequent.

There are other dangers involved in a too paternal policy in the marketing of the electric range. One housewife who answered for the third time a call from the company's man inquiring if her range was satisfactory asked, "What's wrong with this range, anyway? You all seem terribly afraid it won't work." It is a question whether cook books instructing the new owner how to cook dainty dishes electrically do not suggest that this is a strange art rather than merely a more convenient and more satisfactory way of doing what she has always done.

The experience of the past few years which has shown that ranges can be sold on their own merits, even at high prices and without further advertising on the part of the companies, who have on the whole avoided rather than encouraged this business, would indicate that the range field is no longer in a state of experimentation and no longer requires the special inducements of the introductory period. It is time that the electric range stood on its own feet, with an adequate rate which is fairly comparable with the costs of gas and coal for similar use and with a service policy which, though liberal, presumes that the customer will gladly pay his own way.

Do you never see your wife at the breakfast table?

MAKE IT AN ELECTRICAL CHRISTMAS WITH A WAFFLE IRON



AIRPLANE FOR LUMBER COMPANY USE

In view of the importance of the airplane in surveying and cruising for lumber companies over areas made almost inaccessible by the dense underbrush, as well as in guarding against fires, the accompanying picture taken from an airplane for the Snoqualmie Falls Lumber Company near Seattle, Washington, is of special interest as showing the clear definition of the wooded areas and habitations. The picture is a unique view of both the lumber company's plant, shown in the background, and the beautiful Snoqualmie Falls plants of the Puget Sound Power and Light Company in the foreground. The entrance to the shaft leading to the cavity plant which is hollowed out of solid granite 220 ft. underground, is located just to the left of the white buildings above the falls. The spurt of white water to the right of the falls indicates the mouth of the tunnel which serves as tail race. The photograph is copyrighted by the Cress-Dale Photo Company.

Advantages of the Electric Furnace

Demands for certain of the materials needed by modern industry can only be supplied by the electric furnace, which has become an essential tool in the hands of the up-to-date metallurgist. To a large extent progress has become a matter of refinement and in the utilization of metals this has become a question of the production of special alloys possessing qualities that fit them for specific uses. Aluminum can, for instance, only be produced by the electrolysis of a fused bath of its salts, and in a practical way this requires an electric furnace consuming large quantities of power. The price of the product is dependent upon the cost of power, but whatever the price, aluminum has become an essential industrial material. But we are not satisfied to use aluminum in a pure form; its fitness for certain uses can be improved by alloying with copper, magnesium and other metals; thus for the pistons of automobile engines aluminum alloys are used, a superior piston is obtained, both from the point of lightness and durability, with the result that the product is essentially cheaper, both in first cost and in the long run.

In the field of ferrous alloys, the electric furnace is essential from the point of purity of the product. Often the electric furnace is the only means of producing these alloys, and in some cases by its use a cheaper product is obtained. Manganese steel can be produced more cheaply in the electric furnace than by other means and the product so obtained is superior in quality. In the non-ferrous alloy field, the use of the electric furnace is increasing rapidly; a larger quantity of metal can be poured in one heat, as a more uniform product results, and there is an important saving in the alloying metal. To illustrate: brass, an alloy of copper and zinc, was formerly made entirely in crucible furnaces, the quantity melted was at the most a few hundred pounds, there was a loss of zinc which added to the cost; but using an electric furnace several thousand pounds can be produced in one melt and the loss of zinc is small, in good operation less than two per cent. Most important, with a reasonable power cost, the price per pound is less than with a crucible furnace.

There are but few electric furnace installations on the Pacific Coast. This is possibly due to a lack of knowledge of the advantages both in quality of product and in the lessened cost of production that can be obtained by their use. Electrical development in the West is making rapid strides; with a full appreciation of the economy to be obtained, progress in development and use of the electric furnace is sure to come and the West will do its part in the world-wide effort to make good metal better.

A Joint Utility Campaign

Under the leadership of the Public Policy Committee of the Northwest Electric Light and Power Association for Oregon, plans have been made for the working out of a joint public utility organization of that state which shall not only deal with questions of public relationships as necessity for such action arises, but shall take the lead in formulating public opinion in relation to public utility questions. This organization is to include water and gas corporations as well as electric companies and is modeled after similar bodies which have done good work in some of the Eastern states.

The idea back of this movement is that public utility interests should not wait for a destructive force to grow up against them in the community and then combat that force, but should mold public opinion by constructive advertising. This is a forward move. There has been much talk of the need for action and there have been occasional good-will campaigns on the part of individual companies, but on the whole nothing adequate has come of it. It was interesting to note in a recent electrical convention held in the West how every discussion, whether started on the subject of accounting or the problem of inductive interference, managed to end somehow in the importance of maintaining friendly relations with the public. The public utilities of Oregon evidently propose to do something besides discuss the subject.

Selling a Buyer's Market

There has been a good deal of talk about the transition from a seller's to a buyer's market and the effect which it is going to have upon industry in general. It now looks as though such a change has taken place already, and that every manufacturer, jobber and retailer is now right up against the proposition of **selling** his products rather than of taking orders for them. In other words, we have all of us got to become salesmen instead of order takers. The good old days of selling are with us again, and this means in many cases an entire revision of merchandising plans.

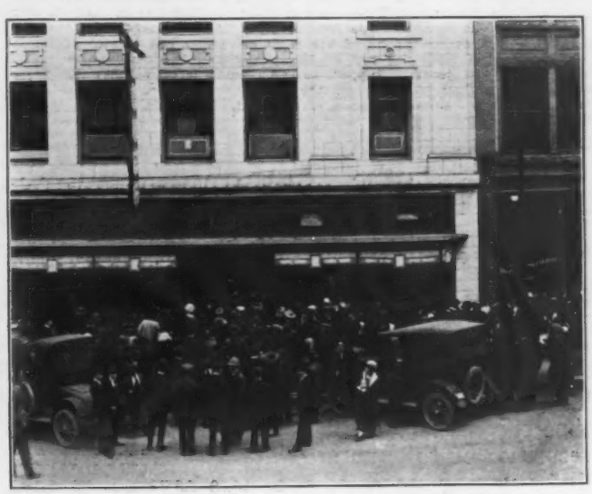
Of very far-reaching importance in future merchandising plans must be the matter of advertising and advertising copy. While in a great many cases the advertising appropriation must be increased in order to enable the manufacturer or distributor to put over the real sales message, there are many other cases where the proper conservation of the present advertising appropriation and the spending of it in real mediums to the best possible advantage will be sufficient without any increase. Many concerns have been frittering away their advertising appropriations by a little ad here and a little ad there, whereas the concentration of their advertising in a few mediums would make them look like big advertisers and get them very much better results.

No house is too big to be immune from the loss of trade during the present situation, and wise, constructive, confidence breathing merchandising and selling methods will yield more profits later than immediate fat orders. The manufacturer who gets healthy orders today must recognize that the sale of his product depends first of all on business conditions beyond his control; secondly, on the ability of his buyers to adapt their businesses to fundamental economic conditions; and thirdly upon the skill of the manufacturer's advertising and sales department in creating a desire for his particular product.

As Mr. Lewis said in a recent address before the Associated Business Papers, "Mr. Manufacturer has got to quit looking out at the world through his factory windows and stop accepting second-hand opinions from prejudiced observers regarding market conditions." This means that the manufacturer or the distributor must determine for himself what are the conditions surrounding the sale of his product, and then apply the remedy in the shape of better merchandising methods and a business-like use of his advertising appropriation.

The Rise of Electric Welding

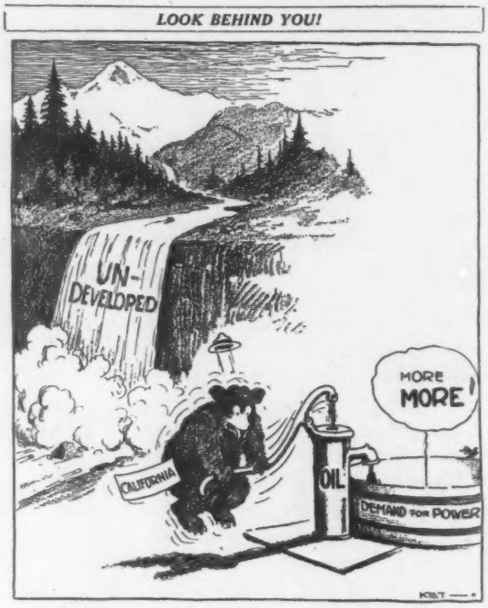
Outdistanced only by the electric furnace is the rise of electric welding in modern industrial activity. It is now a well known fact that electric welding played a vital part in rehabilitating the German ships dismantled in American ports during the war period, thus expediting the transportation of troops to Europe and bringing about the successful consummation of the war. In the building of the merchant marine, too, in the various shipyards of the country, the applications of electric welding are constantly increasing in number. For some time past electric welding has been used in the building of ships in the equipment having to do with the ladders, uptakes, flanges and deck fittings, but its use in structural parts or floating equipment has been very limited. On another page of this issue of the Journal of Electricity will be found an interesting account of a new advance in electrical welding accomplishment, involving its use in the construction of the floating equipment of dredgers, the reclaiming of cutters on dredgers, and the riveting of flanges. This replacing of the old riveting methods by electric welding has brought out decided econ-



MONTANA HOLDS FIRST ELECTRICAL SHOW

In the early part of October the first electrical show ever held in Montana was put on by the Montana Power Company in its offices at Butte, with the assistance of the local supply jobbers and dealers. Fifteen thousand people visited the show which was open during the evening to accomodate those who could not visit the exhibition during the day. Full-page advertisements calling attention to the show were run in the daily papers in Butte, and additional publicity was obtained by folders which were mailed to all local consumers. One of the features of the show was the raffling of several electrical prizes consisting of a washing machine, a portable lamp and shade, a vacuum cleaner and a grill, for which tickets were given away to each consumer of the power company. The show was held under the direction of J. Ryan Gaul, commercial manager of the Montana Power Company, and D. J. McGonigle, district sales manager of the Montana Power Company. The effects of this show have been already noted in a greatly increased activity in the sales of electric appliances, and particular attention is being given to these in a series of follow-up suggestions for electrical Christmas gifts. The success of this show has been so marked that there is every likelihood of its being made an annual affair.

omies. It is interesting to note that one suction dredge in California having a suction pipe diameter of twenty-two inches, made of one-half inch plate, has employed the electric welding process since 1912. Not only does this type of welding make for a saving in labor when compared with the riveted method, but the flanges are used time and again on the electric welding process in a way that would be impossible under the former methods. Surely industrial engineers have before them a magnificent new field to stir the imagination in ferreting out new and important applications of electric welding.



NEWSPAPER SUPPORT IN WATER POWER DEVELOPMENT

With construction plans which call for an expenditure of over three-quarter billion dollars in the next ten years, Western power companies have found that both the strength and weakness of their position lies in their dependence upon public support. The justice of the "self-interest" plea, however, as presented both orally and in the technical press, has already found its response in the ready interest of the public and the newspapers of the West have given generous support to the campaign for wider water power development. Such cartoons as the one shown above, which appeared recently in the Oakland Tribune of Oakland, California, help to lay the firmest foundations for later bond issues to finance hydroelectric projects.

The Question of Outside Securities

That the gigantic power development schedule of the West has attracted nation-wide attention, is best evidenced by the fact that a number of hydroelectric securities from outside districts are now being put upon the markets of California and the other states of this region. This comes as a great compliment to the forward-looking people who dwell in this district; at the same time citizens might well bear in mind the fact that securities of this nature vary in different states. Those issuing securities elsewhere have not reached the same high stage of development as similar enterprises in the West, and often have not the same type of regulation behind them to ensure equal permanence to their securities. As a consequence, people of California and other states of the West would do well to investigate carefully when purchasing securities unknown to this district.

There is also the problem of local self-interest; the West needs its own moneys for its own development. This factor should rightfully have a deterrent effect in the promotion of so-called foreign securities or securities of other states of the Union beyond the Rockies, that are being marketed in the West.

The Big Idea

This old world of ours, torn with dissension as the result of the greatest war of history, is now about to enter its third period. First came the conflict with its awful loss of life and property, then followed a desperate period of rehabilitation, and now business effort pauses a moment to enter upon the third and last era in the cycle. Prodigal spending to save the nation during the conflict passed with the signing of the armistice. Stifling profiteering immediately following this, and while the nation was struggling to regain its balance, is now passing, and we enter a period of sane, sound and constructive thinking.

The world has learned much through it all. It has learned a broader sympathy for the other man and his problems. In the new era upon which we are now entering, only those industries and those enterprises will survive which are based upon a fundamental service, a service rendered at a reasonable and just cost to the consumer. The electrical industry stands forth best of all to meet the crisis. Its record of expenditures is an open book, its investments are sound and its service basic. With its high ideals held in view, particularly those ideals of Western utility companies brought out in recent utterances of their leaders, no lack of support on the part of the public is to be feared. With this ideal, then, of first establishing a constructive service to the people, and second, of seeing that this ideal of service is carried into operation, the Journal of Electricity again dedicates its pages to the service of industry in seeing to it that the public senses this vision of service, and renders to such service its just due — a fair, reasonable, and indeed a generous treatment.

How to Get New Industries

The West is passing through a very interesting and prosperous period of development. New industries are seeking admission to many quarters of the West. Citizens, particularly those of the electrical industry, may help in this situation by having at hand some information for everyone who comes to them with an inquiry. The compiling, printing and publishing in every form of every kind of data pertaining to industry in the West should be encouraged. The electrical industry is the basic industry upon which all types of progress in manufacturing must depend. Let men of the electrical industry through their development leagues, through their National Electric Light Association, through their engineering organizations and through their technical and trade magazines devote special attention to the gathering of statistical data

on the industrial possibilities of the West, and it is safe to say that the next ten-year period will witness the most remarkable development ever known in the growth of the West. Let us then, as the new year approaches, make one resolution, and that is that in the months to come we will each and all render a greater service to industry, and champion it throughout the West. Let our news, our advertising, our educational efforts, our inspirational themes, our personal interviews and our research activities visualize industrial possibilities of the West. Thus, and thus alone may the West continue in that type of leadership which through its enthusiasm, vigor, daring, and newness of life has become so fundamental in its traditions.

Freight Increase Affects Chemical Production

Hitherto the so-called heavy chemicals, as for instance, caustic soda, soda ash, sodium sulphate, sulphuric and other acids, have been manufactured in large quantities in the West, while these states have had to import from Eastern points the so-called intermediate and refined chemicals. Since the recent raise in freight rates it is interesting to note that chemical industries in the West are manufacturing on a larger scale the chemicals which heretofore have been imported, and a decided impetus is given to those chemical industries already in existence. The Stauffer Chemical Company of Stege, California, has about completed an addition to its plant which will make it a large producer of sulphuric acid and other chemicals. The General Chemical Company at El Segundo near Los Angeles is installing a contact sulphuric acid plant for oleum and this plant will soon be in operation. Some of the refined chemicals which are now being manufactured on the Pacific Coast are sodium hyposulphite, magnesium sulphate, tartaric, buteric, citric and other acids, sodium potassium tartarate, better known as Rochelle salts, and some of the aniline dyes. It would seem, therefore, that the outlook for the West for chemical products, both heavy, intermediate and refined, is unusually bright from the manufacturing viewpoint.

Advertising Sanity

Advertising damaging facts which are true leads to their rectification—the advertising of untruths or of facts so distorted as to convey untruths leads to violence and revolution. If there is any menace of radicalism in this country today it lies in the misunderstandings which are intentionally or unintentionally spread broadcast by agitators and fanatics. There are few people who are wilfully violent without the urge of what they believe to be an intolerable situation — the vast majority of all classes are unjust only when they are ignorant. Unfortunately the common method of handling the situation at the present time seems to be by means of troops and prison sentences in the assumption that mistakes are rectified in this way. There is more than one instance of a strike, which was a matter of a few well-advertised lies spread by agitators, being fought out to a finish and won by the side in which justice inhered without the mistaken employes ever being disabused of the idea that they were unjustly treated.

Business men have learned the value of advertising—why not apply its magic to the intricacies of the present situation? No lie was ever defeated except by the truth—why not do a little advertising of the truth? The adherents of that radical movement which has become known in America under the loose title of "bolshevist" are possessed of an apostolic enthusiasm which leads to most ambitious campaigns of propaganda. We believe their fundamental idea to be wrong; we know that they have made most unscrupulous use of untruths in the interest of gaining believers. What are we going to do about it? We can put its adherents in prison, we can ship them out of the country—and perhaps both steps are necessary on occasion to curb the immediate problem with which we are faced—but in so doing we have done no more than meet an immediate emergency with methods which must be defended solely on the grounds of expediency. We cannot prevent the untruths and half-truths from working on in the minds of those who can read and who can converse between themselves—that is, we cannot prevent this unless we combat it by spreading the statement of the truth. The true protection against Bolshevism, as against radicalism of all kinds, lies in advertising—the advertising of sanity.

The Convenience Outlet Campaign

Much has been accomplished in recent months by the California Electrical Cooperative Campaign in its effort to introduce the electrical home idea throughout the West. Great, however, as have been these accomplishments, there is still much to be done. National manufacturers as well as the architect and home builder need to realize more than ever before that only as the convenience outlet is instituted in the home can the uses of electricity be extended. It would be well, then, that in all phases of advertising and every campaign of a selling nature, manufacturers should bear in mind this fundamental point that only as the home builder and the architect learn to include in all new building plans ample convenience outlets can the electrical industry go ahead with full development in the home electrical idea as dreamed of by those who have its best interests at heart.

A New Journal Service

The importance of the news department of a technical paper in keeping its readers in touch with whatever is of interest and importance from their standpoint in world events has led the Journal of Electricity from time to time to enlarge and better this section of its service. With a view to a more comprehensive and authoritative review of significant happenings, a new system of field and market reports is now being worked out and will soon be put into effect which will still further improve the news value of the Journal of Electricity to western industry beyond the scope of any other technical paper now serving this region.

Electric Welding Practice

BY J. H. ANDERTON

(The place of electric welding in industry, especially in the shipbuilding industry, becomes increasingly important. Its development and application are taken up in an article by the chief electrical engineer for Stone & Webster, Inc., of which the following is the first part. The author was also a member of the electric welding committee of the Emergency Fleet Corporation.—The Editor.)

Previous to the great war, all forms of electric welding had been carried on in this country for many years. The most extensive development up to that time was that of spot or butt welding and many of these machines were in use for the assembly of such parts as metal window sash, wire reinforcement for concrete and other similar products. Adaptations of the spot welding idea are found in the butt welding machines for the welding of high speed and expensive tool steels to less expensive shanks, etc. The two forms of arc welding were in use; that is, the carbon arc in which the metal is fed independently into the arc formed by the carbon pencil and the work, and the metal arc process in which the metal pencil itself is deposited in the weld. Of these two latter processes, the carbon arc was and is confined principally to the filling of large castings and similar work. The metal arc process was, however, rapidly becoming recognized as more universally applicable for welding purposes and a large number of our most important railroads were using it extensively for the repairs of locomotive boilers, locomotive frames, cylinders and many other places, some of which could not otherwise have been repaired. Certain shipyards were also using arc welding, mostly confining its uses to places where gas or other welding could not be successfully applied, or where strength of the weld was unimportant.

The character of a weld is largely dependent upon the skill of the operator. The above picture shows the welding of a dipper pan—a piece of very light work in steel.

In 1917 the American Institute of Electrical Engineers, recognizing the increasing importance of electric welding to the industry, organized a subcommittee of the Research Committee for the purpose of investigating possible improvements in the technique and general knowledge of the subject. In March of 1918 the Emergency Fleet Corporation appointed this sub-committee as a special committee to advise the Corporation as to the status of the art with special reference to its application in hastening the steel ship program. This committee held weekly meetings at the Institute headquarters in New York and arranged for visits of Captain Caldwell of the British army to this country for the purpose of explaining methods and the extent of the application in Great Britain. Commander Goodall of the British navy also assisted in this connection.

The results of the labor of this committee was the compilation of a great amount of data pertaining to welding in general and the awakening of an interest, particularly in the shipyards, in it as a method of primary construction worthy of some consideration. Coincident with the shipyard development, various other uses were found in manufacturing lines, and it may be of interest to know that the Liberty Motor is in no small measure indebted to electric arc welding for its success.

The Need for Skilled Welders

It was early recognized by the committee that one of the primary and most important requisites of good welding was good welders. So much so-called welding had been done by unskilled and untrained workmen that it was difficult to overcome a natural prejudice against electric welding. Statements and test data showing results of welding on plates and other parts having strength characteristics much in excess of riveting were of little avail when one could go aboard a ship or to a shop and knock so-called welds apart by means of a light hammer. A second limitation to the advancement of welding on ship construction was the attitude of Lloyd's Register of Shipping and the American Bureau of Shipping. It must be admitted that steel ships are complex structures subject to very complex stresses in operation. The attitude assumed, therefore, by the shipping bureaus that they would approve ship construction in which welding was used only after due consultation, was to be expected.

The committee therefore took upon itself the training of electric welders at various centers throughout the country. These men and women were made available to the shipyards as fast as they showed competency. Most of the yards themselves, at the suggestion of the Emergency Fleet Corporation, started schools for this purpose and trained their own operators. The committee was also finally successful in obtaining from the shipping bureaus a list of parts upon which arc welding would be permitted. This list has been extended from time to time to include such other items as knowledge and experience has indicated could be included, so that today any shipyard with the proper equipment for

arc welding and skilled operators may weld hundreds and in some cases thousands of parts in ship construction where bolting and riveting was formerly used, and at a much lower cost.

New Processes and the Shipbuilding Industry

It is doubtful if there is any industry where it is more difficult to introduce new methods, and particularly radical ones, than in shipbuilding. Established methods of successful practice based on a wide experience have become fixed in the art and in the minds of the builders, and the difficulty of establishing new processes which will meet with the approval of the various interests is a very real one. In view of the above, the progress made in the past five years may be considered remarkable and while the greatest attention has been paid to welding as confined to ship construction, present indications are that far greater use will be made of it in other lines of manufacture. For instance, one very important electrical manufacturer is now arc welding transformer tanks 20 feet high by approximately 10 feet in diameter, replacing practically all riveting in the longitudinal and girth joints by V-welds, welding in the bottom to the sides and welding on the bottom stiffening beams, also the oil and water connections with absolute certainty that there will be none of the oil leakage which has heretofore been so troublesome to operators of large transformers. In general, electric welding may be considered to have arrived at a stage where its increased use is dependent upon a more extended or proper distribution of the knowledge required for its application.

Electric Welding Systems

As intimated above, there are two distinct varieties of electric welding successfully developed to be of any practical value to industry today; that is, resistance (butt, line and spot type) and arc welding. As they differ considerably, both in principle and application, a short description of each is given, together with their possibilities of application.

Resistance Welding: By this type of welding it is possible to secure sufficient jointure between lapped surfaces of plates, abutting ends of bars, rods, tubes, etc., of ferrous and non-ferrous materials, by first raising the temperature of the joint to a welding heat (by the passage of a heavy current) and then applying pressure to the joint to cause proper fusion and flow of metal. The process being based on the resistance of an electric conductor, it follows that the temperature rise is greatest at the point of highest resistance within the limits of actual contact. The heating effect is therefore localized at the spot where it is required. This, added to the close regulation of temperature obtainable by controlling the current flow, gives excellent results. Butt welders operating on the above principle are used for the welding of rods, tubes, bars., etc., such as shafting, machine tools, and many other applications. Line welders have been used to a limited extent for the making of continuous welds on lapped plates of comparatively thin metal.

Spot welders have many applications. With this type of machine, lapped edges are introduced between the points of two electrodes which form the terminals of a circuit. For alternating current spot welders the transformer is usually made a part of the machine and it thus becomes portable. For direct current the heavy leads must be connected to it and it is therefore practically fixed to a definite location. In operation, the circuit is closed by the plates or other metal to be welded and the contact resistance causes a rapid rise of temperature at and adjacent to the spot. When the proper temperature is reached, the current is interrupted and pressure applied simultaneously, causing a localized fusion between the plates. This process is repeated at required intervals along the lap, thus giving a series of spot welds and having very much the same appearance as a countersunk riveted joint. Plates, angles and bars up to $\frac{3}{8}$ of an inch in thickness are very extensively welded by this process with a mechanical strength very much in excess of that obtained by riveting. Machines have been constructed for experimental purposes capable of welding three $1\frac{1}{2}$-inch plates together.

The advantages of this type of welding over other methods of jointure are the absence of marking off or laying out, drilling or punching, countersinking, etc. Further, since these machines are almost entirely automatic and fool-proof, the saving in labor, time and improved output is considerable. A future use for fixed spot welders may be seen in the shipyard for attaching plates to angles and similar sections, assembly of coal chutes, ventilator ducts, deck houses, engine and boiler hatch plating, bulkhead stiffeners, etc. It is not expected that spot welders will be useful for the attachment and welding together of ship plating since such machines would have to be of the portable type similar to bull riveters, but much more cumbersome and heavy.

POWER COMPANY VIEWS USED IN PHOTOPLAYS

The "man in the street" will see the story of big hydroelectric construction along with the stories of romance and adventure, according to a recent report which states that the Southern Sierras Power Company has received a request for pictures and descriptions of all hydroelectric power houses on its system, together with those of any distinctive and picturesque features of the transmission and distribution lines. These photographs are to be filed at the New York office of the N. E. L. A. for use of the photoplay industry, which frequently applies there for such data. Demand for pictures and data also comes from writers who exploit basic industries in the popular magazines.

Is the door bell usually out of order?

MAKE IT AN ELECTRICAL CHRISTMAS WITH A BELL RINGING TRANSFORMER

Electric Arc Welding

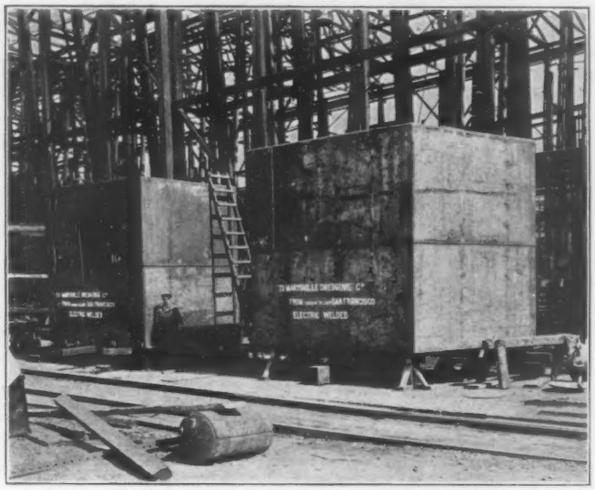
BY F. A. ANDERSON

(Increased efficiency in construction and repair work has been attained in many lines by the use of electric arc welding, and the following article takes up some recent industrial developments in which it has played an important part. The author is senior electrical engineer for the United States Shipping Board, Southern Pacific District, and has contributed several other articles on arc welding to the Journal of Electricity.—The Editor.)

Electric arc welding became particularly prominent during the war and was used to a great extent in the shipbuilding program, where its use increased production in a number of ways. It was not generally accepted for use on hull work or the floating equipment of vessels.

Arc Welded Pontoons for a Gold Dredge

The Marysville gold dredge Number 5 is used to reclaim the gold lost through the various processes previously employed for extracting this metal from the earth. Although this per cent of gold is



View of electrically welded pontoons which were made for the Marysville Dredging Company. These pontoons are 9 ft. by 14 ft. by 11 ft. 6 in. and in the final hydrostatic test did not show a single leak.

very small—said to be about 7c. per yard—these dredges extract it so successfully that they prove a wonderfully paying investment.

It was originally designed to dig to a 70-ft. depth below the water level. It was desired to increase this digging depth to 88 feet below water level and provide for handling a bank to a height of 20 feet above water level—a total range of 108 feet. This change necessitated the extension of the ladder and buckets, and also made necessary a greater buoyancy at the bow.

It will be noted that the bows of these dredges are cut in two, allowing for the operation of the ladder and buckets. To provide the necessary buoyancy it was decided to attach two pontoons to the bow of this dredge. These pontoons are built of steel, are 14 feet long, 9 feet wide and 11 feet 6 inches deep.

When the pontoons were first designed the usual riveted construction was contemplated, but after considering the saving in time and expense obtained by the use of the arc welding process, the latter was adopted as the most satisfactory method.

All the channels and beams were welded to the plates, employing what is known as the tack method. The tack method is to make short welds at predetermined or intermediate points.

After the pontoons were completed they were tested hydrostatically and not a single leak was found. There was absolutely no caulking necessary at any point.

Departure From Usual Practice

It is believed that these two pontoons are one of the largest recent developments where arc welding has been used throughout for any part of the floating equipment of a vessel. Here is a floating structure, subject to every strain of the main hull built along the same general lines, with beams, angles and seams held together without the use of a rivet in any part; not a seam to be caulked, not a doubling plate necessary, not a filler used.

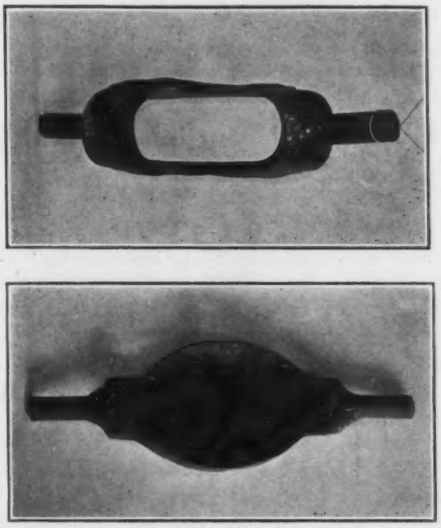
Such a departure from the usually accepted practice should give confidence to those interested in similar work for the employment of arc welding in the cardinal parts of a vessel. Its economy cannot be questioned, for with arc welding properly used, the cost of drilling, reaming and caulking may be eliminated, leaving only the cost of the rivets, their heating and the riveting operation to be offset by the actual operation of arc welding, and in this comparison the advantage would be in favor of the arc welding process. These pontoons showed an actual saving of about 10% in total cost and about 5% in weight of material used.

The pontoons were designed and built under the direction of Mr. George L. Hurst, mechanical engi-

Fig. 2. Cutter head on the suction dredge "Sacramento," showing the new knives welded on to the head.

neer and manager of the dredging department, Union Plant, Bethlehem Shipbuilding Corporation, Ltd., San Francisco, California.

Encouraged by his success with the pontoons, Mr. Hurst had the entire main deck of a gold dredge in Nevada electrically welded. This deck



Figs. 3 and 4. Showing construction of a frame for an ordinary sheave. The main body was cut from steel plate, and the two ends welded together as shown in the upper picture. The round pieces were then welded on either end as in the lower picture.

is 108 feet long by 52 feet wide; every longitudinal and transverse seam is being arc welded.

The plates are ¼-inch thick and were placed allowing for ¼-inch opening between all edges, providing the space for welding.

Transverse beams are on 30-inch centers and plates are secured to these beams by the usual rivets. There was some buckling of plates between beams which was corrected by drilling a ⅝-inch hole between plates and using a bolt with washers on either side of plate to pull the plates into proper position. The holes were finally filled by arc welding.

Welded Cutter Head

Figure 2 is a photograph of the cutter head on the suction dredge "Sacramento," in use by the Third San Francisco District Engineer's Office, United States Army, on dredging work in the upper waters of the Sacramento River. The picture plainly shows the new knives welded on to this cutter head.

These cutter heads are very expensive, and in the past have proven quite an item in the upkeep of the dredging work. They are of cast steel and on account of shape and size must be made in two parts. These parts are bolted together by means of webs or flanges to form the complete unit; this leaves a central section of blade with an open space and also allows the wearing away or "dragging" of the central flanges. As may be seen by the illustration the cutters are welded on the old heads present a continuous cutting edge and prevent the objectionable "dragging" or wearing of the web.

A unique method of employing arc welding in manufacturing is shown in Figures 3 and 4; these two figures show the construction of a frame for an ordinary sheave. The main body was cut from steel plate and formed into shape, the two ends were then welded together as shown in Figure 3. The round pieces were then welded on either end, the weld making a fillet formation shown more clearly in Figure 4. The completion of the sheave follows as in the usual practice.

The Human Equation

An objection often advanced against the use of electric arc welding is the responsibility for its success, which is attributed to the operator, or welder. The fact is not disputed, that the operator must be a mechanic in the true sense of the word. He must be conscientious in his work, and he must be encouraged to attain success. It is not, however, believed that the human factor plays any greater part in the equation of arc welding than it does in any other mechanical trade. For the careless and incompetent workman in any mechanical trade can produce irrevocable loss and create faults which are far-reaching in their effects. The progressive engineer will select or train his men to be capable workmen.

REGISTERING SALES

Any company which sells a considerable amount of any one appliance will appreciate this method of graphically recording sales. The Sacramento Appliance Company displays a map of the city of Sacramento and vicinity, putting a pin of a certain color in the spot where a washing machine has been placed, a pin of a different color where a vacuum cleaner is placed, and so on until it appears that the entire region is a colorful array of electric appliances.

Does the gas heater explode every time you want a hot bath?

MAKE IT AN ELECTRICAL CHRISTMAS WITH AN ELECTRIC WATER HEATER

General Notes on Arc Welding

BY R. E. FRICKEY

(The choice of apparatus for welding, the training of welders, the testing of welds—these are important factors in successful welding, and are here discussed briefly by a consulting electrical welding engineer of San Francisco. Electric welding received a great impetus during wartime shipbuilding activity, and is now taking its place in industry as an important art requiring special skill and training.—The Editor.)

The increase in the application of arc welding during the war period was remarkable. The increase since that time has been steady, and it is probable that the growth of the art in the next decade will be tremendous. In an Eastern city, at a recent mass meeting called to organize a local section of the American Welding Society, there were present over one thousand men, most of whom were interested in arc welding. The peak in the progress curve will come when engineers, designers and manufacturers become personally familiar enough with the art to recognize its merits and limitations. With this familiarity and interest there must develop a sufficient number of proficient welders and men capable of supervising welding work.

Training Electric Welders

During the war period the Emergency Fleet Corporation operated schools for training electric welders. Since these were closed there have been in operation only two or three high grade schools where men are given a thorough training. There should be such a school in every industrial center. Most shipyards, railroads and large manufacturing plants using the process extensively, operate a training school for arc welders. Such schools are usually not elaborate. They are simply suitable places where one or two men at a time may be put through a series of systematic exercises under the supervision of a competent man. Such manual instruction is supplemented with lectures, or at least with informal talks during the working period.

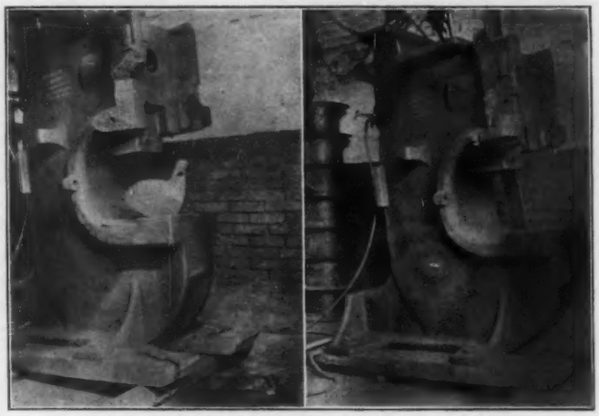
An important feature of the training is the testing of all welds made, either in a pulling machine or by bending or breaking with a sledge. For some classes of repetition work a welder can be trained from suitable material in two or three weeks. For general work a longer period should be given. Great care should be given to the selection of the men to be trained. To make a good welder, a man should be conscientious above all else. Preferably, he should already be a mechanic or at least possess mechanical ability. Much of the good derived from a careful training will be lost if the man is afterward made solely responsible to a department foreman who is himself not a trained welder. It cannot be too strongly emphasized that welders require competent supervision. The welding engineer will require the same high grade training as that now received by the electrical, mechanical or chemical engineer.

Much welding now being done is little more than plastering, and would be as effective if done with "smooth-on." It is true that much useful work need not approach 100 per cent efficiency, yet be good enough for the purpose intended, but the practice of permitting careless work under these conditions makes it next to impossible to get careful work when such work is imperative.

Testing Welds

It is unfortunate that there has not yet been developed a satisfactory non-destructive method for testing welds. One method of promise which has been described is to cut out with a special tool devised for the purpose a circular disc, including about one inch of the weld to be tested. Two suitable plates are welded to this disc so that the weld may be pulled in a testing machine. The hole left by cutting out the sample is closed by welding in a properly prepared solid disc. This method is comparable to the testing of coupons from steel castings.

But welders can be trained so that they can make sound welds repeatedly, and this fact can be



The picture at the left shows a cast iron punch press prepared for welding; note the studding. The picture at the right shows the same press with a completed arc weld.

demonstrated by having them break or pull every weld which they make while in training. When the welder knows, and the man supervising his work knows, that he can make a sound weld every time, considerable confidence can be placed in the work such a man may do. Also, there are many factors which can be checked while the work is in progress. The proper preparation of the work to receive the weld is important. Cleanliness during the welding operation, size of electrode and current value, quality of electrode material, sequence of laying down metal, jigs for holding the work, backing for thin material —these are factors the supervisor can be sure about. Fortunately, too, there are certain "earmarks" about a good weld which can be recognized by a trained man. Among these are the depth of the arc crater, which is an indication of the "penetration" of the added material, and "overlap" of the metal being added, which is an index of proper fusion. In a weld

consisting of several layers, these indicators must be observed during the progress of the work, because only the top layer is visible.

Besides the matter of laying down metal in the proper manner and with the proper care, there is the matter of taking account of strains produced by the contraction of the added metal. Some of the problems arising in this connection are beyond the ability of the average welder and must be left to the supervisor with technical training.

Choice of Apparatus

While the proper selection of apparatus is important, it is not such a large factor in the production of sound welds as is commonly supposed. As good a weld as can be made with the most expensive welding machine can be made from a commercial 110-volt d.c. circuit with the aid of a rheostat constructed from a few cents' worth of fence wire and a bucket of water. Very good welds are being made with alternating current, using a transformer essentially as simple as an ordinary distribution transformer.

However, the choice of apparatus is important from the standpoint of convenience and economy. A modern one-man welding set will have an input of about 5 kw. when delivering 150 amp. welding current, while 16.5 kw. is required for the same welding current from a 110-volt d.c. circuit, not taking into account motor or generator losses. The 60-volt constant potential set is a compromise in point of economy between the one-man set and the 110-volt commercial circuit. It is entirely satisfactory as a welding supply, providing the wiring is so laid out that the voltage drop is not so great as to produce interference between welders. The constant potential system has the advantage over the one-man set that the regulating means may be beside the welders, rather than at some distant point.

There are several a.c. welding transformers on the market. These are considerably cheaper than the d.c. one-man sets, and are of about the same efficiency in energy consumption. The open circuit voltage required for a.c. welding is around 100 volts. The internal leakage reactance of the transformer is made high enough to deliver the desired current with the arc in series. Because of the high open circuit voltage required, the power factor is very low—for example, if 200 amperes at 20 volts, or 4 kw., is utilized at the arc, 200 amperes at 100 volts, plus internal losses, represents the kva. at the primary terminals. It is a curious fact that an external reactance used with a standard distribution transformer does not give the same characteristics for welding as does internal leakage reactance.

Alternating current welding has a legitimate field, although it is, undoubtedly, not as satisfactory for general work as is direct current. It is usually necessary to use some form of covered wire with a.c. Certain types of covered wire, such as those used exclusively in England, operate as well, if not better, on alternating current.

REFRACTORIES IN THE ELECTRIC FURNACE

BY CARL H. BOOTH

(An interesting point bearing on the durability of electric furnaces is brought out in the following extract from a paper delivered at the fall meeting of the Electric Furnace Association by the vice-president of the Booth Electric Furnace Co. The type of electric furnace best suited to industrial demands has been the subject of considerable experiment, and the question of durability and efficiency is of especial interest.—The Editor.)

It is well known that the life of refractories has had a great deal to do with the success or failure of electric melting furnaces. No stationary type of furnace has the same opportunity of securing the long life from refractories as that where the body of the furnace is in motion during some portion of the melting period. Obviously, the best results can be obtained from a furnace in which all parts of the lining are subjected evenly to the same temperature as far as possible, and this result can be further improved if the entire lining is washed by the hot liquid bath of metal, thus aiding in cooling the refractories and securing an even wear.

In the past year and a half adequate records have been secured from a rotating drum type, single phase arc furnace, used principally for the melting of non-ferrous metals, to show an exceptional life of refractories. The construction of this furnace being almost like a barrel, permits the removal of the two flat heads of the cylinder. The standard type of linings used have consisted of only three or four pieces, viz: a large cylindrical tile for the body of the shell and two circular flat end bricks for the ends. After these have been put in place, loose heat insulating material is tamped in hard between the brick and the steel shell and after the top end brick is in place, the steel end plate is bolted onto the shell. The bricks described have been made of a good grade of fire clay and due to the absence of joints and the rotation of the furnace, records have been made of 900 to 1000 heats from a lining. The pouring temperature in most cases will run in the neighborhood of 2100 to 2200° Fahrenheit, although many heats have been made on high temperature alloys where the temperature has averaged 3000° Fahrenheit.

The experience with this type of furnace bears out the statement that where the construction of the equipment permits the washing of the complete lining with the liquid bath the best possible life of refractories can be secured. It also demonstrates that it is entirely practical to use the ordinary class of material, which can be bought at the lowest price, and secure exceptionally long life refractories.

Does the Christmas tree remain dark after the first candles are burned out?

MAKE IT AN ELECTRICAL CHRISTMAS WITH A CHRISTMAS TREE OUTFIT

Public Utilities and the Railroad Commission

(The confidence of the public is essential to the successful and efficient service of the public utility. The following summary of a speech by the president of the California Railroad Commission points out the dangers of misrepresenting to the public the needs and plans which are vital to their well-being.—The Editor.)

Declaring that criticism of the California Railroad Commission is usually based on misstatements of a fact or a purpose, Edwin O. Edgerton, president of the Commission, in an address at a meeting of the League of California Municipalities held at Chico, November 10, told the representatives of the several score of California towns and cities present that they owed it to their constituents to inform themselves fully as to public utility matters before venturing to advise them. "It is important," said Mr. Edgerton, "that you do not by misstatement either purposely or ignorantly shake the confidence of the public in so important a matter as the regulation of public utilities."

Millions Must Be Spent

He emphasized the importance of the work of the Commission by declaring that hundreds of millions of dollars must be invested in this state by utility investors within the next few years, and that California progress will be seriously retarded unless the investor is given assurance that his investment will be dealt with fairly and intelligently. After a reference to the Commission's orders in rate proceedings, in which he said that the Commission did not base its findings on guesswork but upon exact information, the head of the California Commission said:

> Instead of criticizing the Commission for thus promptly meeting emergencies, in my judgment it should be applauded. It has been demonstrated in California that public officials will carry out the mandates of the constitution and the law, and do the intelligent thing even at the expense of temporary unpopularity. . . . An answer to most of the objections that have been made to actions of the Commission would be an exposition of the facts.
>
> It must be clearly understood that if California is to progress industrially there must be an immense increase in the facilities of the companies performing public utility service. Expressed in terms of money this will mean several hundred million dollars in the next few years. It must be admitted that there is no power to force investment in the securities of these companies, and sound policy becomes of vital importance in an assurance to the investor that his investment will be dealt with fairly and intelligently, else he will refuse to come in, and progress in the development of California will be seriously retarded. It may fairly be said that California today has a good reputation all over the country because of its attitude towards the public utilities. The impression is abroad that the California Commission will not confiscate money honestly invested, nor on the other hand will it permit extortion at the expense of consumers.

Reasonable Return Allowed

President Edgerton said the Commission was unwilling to assume that the people of California really desired that public utility rates be fixed so low as not to accord a reasonable return to investors —with the result that service will deteriorate and "all progressive increase of plant facilities cease." He said:

> We of the Commission have long felt that this whole matter could be discussed on a basis of the consideration of what is in the interest of the whole state. With years of experience we have convincing proof that the companies delivering to the people these vital public utility services must be kept sound, lest serious injury result in inefficient and bad service to consumers. Our people demand good service and will be satisfied with nothing less, and it is our conception that they are willing to pay for good service. Equally is it true that it is against the public interest to authorize or permit the exaction of unreasonably high rates for this service, but the placing of rates at an unreasonably low point will do as much injury to the consumers as placing the rates at an unduly high point.
>
> I will make the assertion without qualification that, notwithstanding the substantial increase of rates generally accorded by our Commission to the public utilities, there has been no profiteering in this business in California. It is ridiculous to assert that where a profit of 6 or 7 or 8 per cent is accorded on investment this is profiteering.

Support of Public Opinion Necessary

President Edgerton also made the declaration that it is important that California have a sustained sound policy in dealing with the public utility companies, and that the Commission, as the medium for the official announcement of this policy, should have the support of public opinion. In this connection he said:

> You who are the official representatives of municipalities have a very serious responsibility. It is your obligation, when you advise your constituents on public utility matters, that you not only state the facts as you are informed but that you fully inform yourselves before attempting to speak.
>
> The Commission has the full responsibility of decision in utility matters, and having decided it later could not justify disastrous results by pointing to the request made by official representatives of cities.
>
> Frequently it has occurred that we must deny requests based on limited information which requests, if granted, would have practically annihilated a public utility service and left the consumers in dire straits.
>
> We do not guess at conditions and base our judgment on such guess, but rather do we carefully investigate time and again all of the conditions surrounding each of the utility companies and upon this exact information base our judgment. It is true that in the severe emergencies created by the war and conditions since, the Commission has acted promptly in according rate increases, but while we did not in such proceedings go into the affairs of the company with such particularity as under ordinary circumstances, we nevertheless knew that increased rates were vitally necessary to keep companies functioning and that the increase accorded would not result in unreasonably burdening consumers.

No Confiscation, No Extortion

Concluding his address, Mr. Edgerton said:

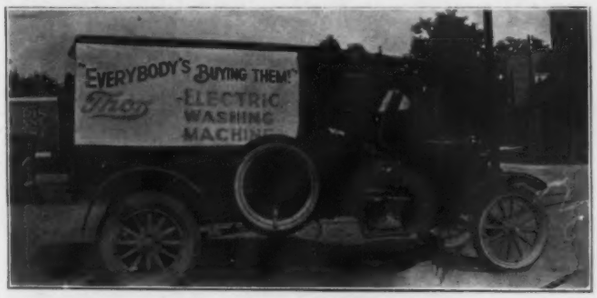
> We might summarize our attitude towards investors in public utility enterprises in California by saying: We recognize your investment will result in common good. You are about to become a partner in an enterprise which will develop the community. We realize that the constitution of the United States and of California and the laws enacted thereunder are designed to protect your investment against confiscation. We are in full accord with the spirit of these laws and propose to proceed in accordance therewith. Furthermore, we believe it to be sound policy and in the interest of the public that your investment be protected and that you be accorded reasonable returns thereon, recognizing of course, that some risk attaches to all private enterprise. At the same time we inform you that you will not be permitted to make exorbitant profits nor will you be permitted to burden the consumers with poor service. Having said this to the investors we should carry out our pronouncements honestly and consistently, not only as a matter of honor but in the interest of the progress and development of the state.

A Sales Campaign on Electric Washing Machines

BY H. L. COOK

(Originality in advertising is one of the strongest factors in putting over a campaign successfully. Following is an account of a washing machine campaign carried out along distinctive lines by the Idaho Power Company. The author is salesmanager for the company.—The Editor.)

The first essential in any campaign is to find some method by which a definite prospect list can be secured, an object which was attained in the cast of a Thor Washing Machine campaign put over by the Idaho Power Company during last July, by a prize contest. The company offered a Thor electric washing machine to the customer writing the best article of seventy-five words or less as to why it



A delivery wagon loaded with washing machines was kept on the go in every important town of the power company's territory, whether there were any machines to deliver or not. This bore the sign "Everybody Is Buying Them" and proved to be a most effective continuous demonstration.

would be to the customer's advantage to have an electric washing machine. Advertisements were of course run in all the local papers announcing the contest and besides this, a circular letter was sent to each of the company's customers outlining the rules in detail.

There are several features of the rules which deserve mention. In the first place, contestants were not permitted to mail their answers to the company's office but were required to enclose their article in an envelope and to bring it in person to the power company's office, depositing it there in the cylinder of the Thor machine placed in the main building and in all branches for that purpose. This brought the contestants to a personal view of the machine and at the same time gave the salesmen an opportunity to point out some of the machine's good points.

It was also specifically stated in the rules that this was not a literary contest but would be judged from the thought rather than the manner in which it was presented.

Advertising and letters were gotten out ten days before the opening of the campaign, June 25 being fixed as the date of closing in order to leave time enough for judging the contest and making announcement of the winner. So many requests for an extension of time were sent in, however, at the last minute, that the contest was not actually closed until June 28.

Sales Information From the Letters

Nearly 2,000 answers were received in all—and by reading through a number of them, it was very plainly seen that the customers were more or less sold to the idea of the electric washing machine. In fact, if they were not sold, a great many of them evidently sold themselves by having written the article.

One of the main purposes of the contest, of course, was to obtain a list of prospects, and full instructions were sent to all branch offices as to how to handle the entries. On the closing date, all envelopes were removed from the machine and a list made of the contestants for the use of the sales force in that particular district. The letters were then sent to Boise where the contestants were again listed for a general file of prospects to be circularized from the main office.

An unexpected amount of sales information was obtained by reading through the letters. An article on the advertising of washing machines had come to the writer's attention some months prior to this campaign in which it was pointed out that it was absolutely wrong to use the word "drudgery" in advertising electric appliances, as it was stated, this tended to have a negative effect. This was absolutely disproven by the letters received during this contest. Over 90 per cent of the contestants used the word "drudgery" in their articles and it was difficult not to believe that the biggest appeal which can be made to women on household devices is through pointing

The street cars, with conspicuous advertising signs at the rear, carried the message all day long to all parts of the city.

out the drudgery of their work without such conveniences.

Another interesting feature of the contest was the fact that about 80 per cent of those answering used verbatim the special points which the company

Does rich Aunt Sarah complain of the cold on every visit?

MAKE IT AN ELECTRICAL CHRISTMAS WITH AN ELECTRIC HEATER

had brought out in their washing machine advertising in months past. This indicated that the particular advertising in question had evidently made its impression at the time and that people had been reading it and making note of the various points as they were made.

Contest Results

The decision was in the hands of a committee of judges from the Boise Advertising Club, who announced their decision on July 7. Four answers

Display advertisements were run three times a week in all the daily papers and in all weekly papers in the company's territory. Toward the end of the campaign a series of small ads recurring through the paper announced the end of the sale.

received special commendation and, believing that they could add something to the interest and the advertising value of the contest, the Idaho Power Company added three supplementary prizes to their offer. These were an electric sewing machine, a vacuum cleaner and an electric coffee urn, in the order named.

The prize essay was as follows:

WHY I WANT AN ELECTRIC WASHER

An electric washer is economy, health, wealth, wisdom and happiness personified.

1. Economy —
   - A. Saves time for other duties.
   - B. Saves laundry bills.
   - C. Saves clothes; threads remain unbroken.
2. Health —
   - A. Preserves youth and beauty.
   - B. Preserves energy.
   - C. Preserves cleanliness.
3. Wealth —
   - A. Helps us practice economy.
4. Wisdom —
   - A. Gives time for study.
5. Happiness —
   - A. Gives time for recreation.
   - B. Gives more time to family.
6. And last of all, there will be at least one smiling face on next washday in Payette, Idaho.

A letter was sent out to each contestant announcing the result of the contest and thanking them for their interest—and a few days later another giving the four prize articles. In both letters advertising was omitted, although it was intimated in the closing sentence that the company "hopes more than ever that sooner or later you may all be proud possessors of Thor Electric Washing Machines, which do so much toward lightening the hard work of wash day."

The letters were now returned to the respective branch offices from which they originated so that they could see what particular argument would

FOR SALE—Wash Day Blues. Have been used once a week for years. Former owner has no further use for them, as she has just bought a Thor Electric Washing Machine from the Idaho Power company at their special price and special terms. Inquire of the Happiest Women in Your Town.

FOR SALE—Improved health, increased happiness, more leisure, freedom from the drudgery of wash day. All these virtues combined in one package can be secured until Aug. 1 for $10 down. Buy a Thor Electric Washing Machine during our special July offer and forget your wash day troubles.
IDAHO POWER COMPANY

LOST
One full-size set of wash day worries. Finder may keep them. Former owner has no further use for them, since she bought a Thor Electric Washing Machine for $10 down during the special July Ofer. Inquire at the IDAHO POWER COMPANY.

SITUATION WANTED
WANTED—Washing to do. For two cents an hour I will do your family washing, everything from quilts to laces. No meals required and I am no trouble at all to you. I can have your washing out of the way by 9:30 every Monday morning. I am the Thor Electric Washing Machine. Take advantage of the special terms and the reduced price during July only.
IDAHO POWER COMPANY

Want ads cleverly worded to catch the eye and to appeal to the reader's sense of humor as well as his interest were used to supplement the regular advertising.

appeal to the contestant before going and talking to her. It was felt that this personal angle had much to do with the success of the sales work done.

Advertising the Campaign

Advertising for the campaign was begun on the 27th of the preceding month and every day thereafter including the first, an ad appeared calling attention to the special campaign ahead. On the first of July, the advertising was placed on its regular basis of three times a week in all daily papers and in all weekly papers. Toward the end of the month the large single insertion was changed to a number of small cuts running throughout the paper calling attention to the advance in price at the end of the campaign.

Opportunity is Knocking at Your Door
NOW

YOU CAN BUY A
THOR
ELECTRIC WASHING MACHINE
AT A REDUCED PRICE
JULY ONLY
$10 DOWN

A Thor lasts a Lifetime

DON'T LET THIS OPPORTUNITY SLIP AWAY FROM YOU

ELECTRIC SHOP
IDAHO POWER COMPANY
BOISE, IDAHO

Tags were hung on the doorknob of every residence consumer. These had all the advantage of handbills in the instantaneous attention they received without the annoyance usually attached to loose bits of paper which clutter up the sidewalk.

A series of letters were sent out to all those whose names had been obtained through the contest and in addition a more personal letter was directed to all people reported by salesmen in their Daily Sales Reports as being interested in a washing machine.

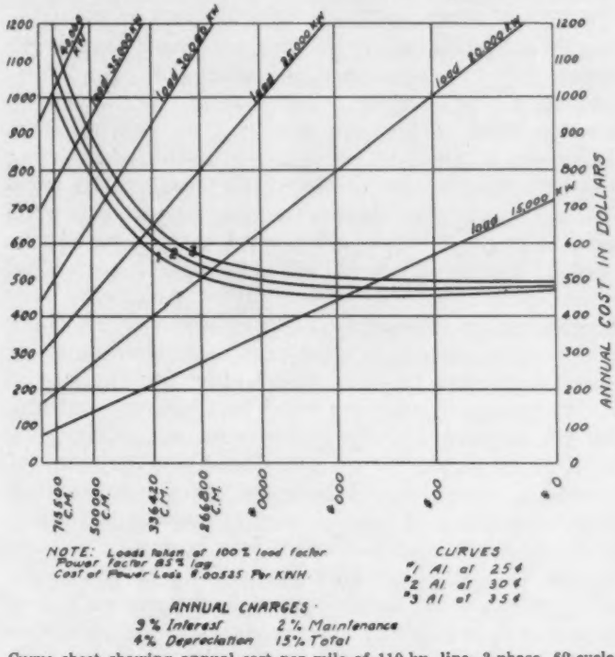
A bogie of three hundred machines had been set for the campaign—and was surpassed on the last day. The total for the month reached 304 washing machines, of which 282 were Thors and 22 Automatics of the other type carried by the company. The campaign was typical of all such sales in that a great many of the people waited until the last two days, 62 machines being sold on the last day of the month. In view of the extremely hot weather, as well as conditions of business depression, it was felt that all expectations had been fulfilled. It was also established that a campaign can make a good sales month out of a poor one.

A 110,000-Volt Wood Pole Transmission Line

BY L. J. MOORE

(Transmission line economies are of particular importance in the West where long-distance transmission at high voltage is the rule rather than the exception. The details of a wood pole line involving a number of economies are described here by the electrical engineer for the San Joaquin Light & Power Corporation.—The Editor.)

In designing the transmission line which was to carry the power from San Joaquin Light & Power Corporation's Kerckhoff Power House into the San Joaquin Valley, one of the most important considerations was that of right-of-way. The line must of necessity be constructed for the greater part of its length through the most highly cultivated part of the valley. Private rights-of-way would naturally



Curve sheet showing annual cost per mile of 110-kv. line, 3-phase, 60-cycle, aluminum conductor, San Joaquin Light & Power Corporation.

have cost a large sum of money, both on account of the high value of the land and on account of the large acreage being owned by foreign born citizens, many of whom practically refused any concession. The only alternative left was to build along public highways, which meant structures with very narrow bases, or in other words, steel or wood poles.

The construction of a high tension power line on poles, immediately raised the problem of clearances between conductors. Ten feet clearance was considered quite feasible, but any more than that was considered rather dangerous on account of the fact that it would make the poles top heavy and would further hang the conductors too great a distance into the private property along the highway. The matter of clearance in such construction worked out toward a medium high voltage line.

Adapting Line to Existing Facilities

The location of substations and sources of power along the line also worked out for the more moderate voltage. The company had already in operation a large ring system of 66,000-volt lines, approximately covering the San Joaquin Valley, and a line running practically due south from the Kerckhoff Power House would cut across this ring system, dividing it very closely in half and permitting step-downs to 66 kv. to be made at very advantageous points. A substation on the line east of Fresno and provided with the necessary outgoing 66-kv. line to Fresno and Reedley would effectively serve Fresno, the largest city in the valley, as well as the heavy irrigating load thereabouts. Another step-down at Corcoran would carry the Coalinga oil fields and the 66-kv. line to the coast over existing 66-kv. lines. Another step-down station at McKittrick would adequately care for the oil field loads in that district. Stations at these locations would allow the old ring system to be operated in sections so that in no case would the economical transmission distance for 66 kv. be exceeded and the new line would operate as a high tension bus for the system, provision being made for incoming lines from the company's Kings River plants to connect at the substation east of Fresno. To take care of the north district around Merced an extension of the high voltage bus is contemplated to extend west from the Kerckhoff Plant and reach as near the center of distribution as practicable, there being stepping down as in the other cases to 66 kv. and feeding into the old network of lines of that voltage. Power from the Bakersfield steam plant would enter the high tension line through the station at McKittrick, thus providing at least three points at which power would be fed into the line with more than that many points where power would be distributed from the line, and in no case would the actual straight away distance of transmission greatly exceed seventy miles, with the steam plant operating. The short distance of transmission thus obtained was another reason for adopting a voltage only moderately high.

Safety Factors in Construction

The altitude on the line is practically sea level; the highest point reached from the plant is about 1200 feet and that for a very short distance. Therefore the best conditions possible for corona were present. A study of all conditions showed that by using stranded aluminum conductors a cross section could be obtained which would be safe from corona and at the same time have the economical carrying capacity for the estimated load of the plant. This

Does the cook leave because the house has no electric conveniences?

MAKE IT AN ELECTRICAL CHRISTMAS WITH A VACUUM CLEANER

was obtained by figuring the plant at 30,000 kw. maximum with a load factor of 70 per cent, using a line 135 miles long with a voltage of 110,000. From the discussion already given of the location of incoming feeds and distribution points, it is evident that much more than 30,000 kw. can be handled over the line without exceeding the economical current density.

110,000 volts was chosen as the transmission voltage to be used. A line was designed using 266,000 c.m. all aluminum conductors on sixty-foot steel poles, spaced 587 feet apart, or nine to the mile. A loading of 8.75 pounds of wind per square foot without any ice or snow was used in the calculations. The question then arose of using wood poles of the same length instead of steel, leaving spans the same. With the same conductor and wind pressure it was found that a sixty-foot pole with a 9-inch top and 15-inch diameter at the ground line had a factor of safety of 3.10 against horizontal loads and of 10 as a column. When the fact is considered that the Weather Bureau records of Fresno, for a period of over thirty years, show a maximum of 4.5 pounds per square foot of wind pressure, the factor of safety is then seen to be more nearly 6, which provides ample safety. As a matter of fact, the poles as installed ran near to 20 inches in diameter at the ground, so a line is safe enough from overturning if the setting is secure.

Expressing the factors of safety as the ratio of the ultimate working strength to the stress which would be applied under the maximum loading conditions, the safety factors found in the design are as follows:

Conductors	2
Pole line hardware	4
Insulators on dead ends	3
Insulators in suspension	12
Guy insulators (interlocking)	2
Guys	2
Wood poles as a column	10
Wood poles transverse loading, railroad crossing	5
Wood poles transverse loading, highways	3.4
Steel cross arms: vertical loads	7
dead ends	3.6
Foundation against depression	3

The line falls entirely within light loading territory and the above factors are materially greater than those set up in the proposed rules. Furthermore, the figures are based upon the assumption that the poles have a diameter of 15 inches at the ground line while the general average, as stated above, is more nearly 20 inches. The safety factor of 5 for railroad crossings is obtained by shortening the span at such crossings to 200 feet. All poles in straight-away work were set 8 feet in the ground and all dead ends and corners were set 9 feet in the ground. As a check on the depth of setting, all poles were stamped with the company's initials at a distance of ten feet from the bottom. The distance of this out of the ground is a direct indication of the depth of setting.

Economy in Use of Wood Poles

As to the economy of wood poles as compared to the steel poles, the following figures are given:

The lowest priced satisfactory steel pole, set in place, would have cost, using July, 1920, prices, $148.60. This includes a concrete base. A creosoted wood pole installed would cost $69.50, showing a saving of $79.10 per pole. This saving at seven per cent interest compounded annually, would amount to $306.12 at the end of twenty years. From the past experience of this company and the opinions expressed by others, creosoted wood poles show an average life of about twenty years. The interest alone on the money saved in this particular instance would amount to $227.02 in twenty years. This is 3.26 times the original cost of the wood pole installed, and it is thus seen that even if poles practically doubled in cost in that time, it would still be possible to replace them with the interest on the money saved. At the time of construction, the difference between wood and steel was even greater than that here indicated because wood poles at that time cost about 50 per cent of what they do today. The increase in the cost of steel, however, has not been so great.

Wood poles show greater mechanical strength when they are new than the steel pole which was considered. This is proper in that the rate of deterioration of wood is much greater than that of steel. However, it shows an angle in the matter of choosing between the two materials which must not be overlooked. If the steel pole is to compete with the wood pole in price, it must be designed with as small factors of safety as are at all safe for the individual installation in mind. Wood poles as a rule have larger factors of safety than necessary, especially where the conductors used are medium or small in size. It is often possible then to increase the size of conductor on an existing wood pole line without any danger whatever, whereas the same procedure on a steel pole line might not be allowable on account of exceeding the mechanical strength of the supporting members. In distribution work it is often necessary to hang a bank of transformers on a pole already installed in the line. If the pole is of wood, the chances are that the procedure is entirely safe, but if it is a steel pole the loading must be carefully calculated and the strength of the pole compared with the result to see whether or not it is necessary to install a heavier pole.

Interruption of Line Service

From a standpoint of service, it is no doubt true that a steel pole is the better. Its life is of course longer than that of a wood pole, and if this is twice as long, it naturally holds that the interruptions to service for the changing of supports would be not over one-half the number in case of steel as of wood. However, in the particular instance herein described, it is felt that the line as constructed is not large enough to handle the ultimate power transmission of the company and that at least a second one of the same capacity paralleling the first in route as nearly as possible, must be constructed sooner or later. It is hoped to carry this line through the same substations as the first and to install balanced relay protection between the two in all sections. This will practically eliminate the interruptions from ordinary cases of trouble, and the fact that the line is constructed in duplicate will make it possible to change poles when necessary without interruption to service.

(Continued on page 546)

Trunk Transmission Lines

BY C. EDWARD MAGNUSSON

(Shall the transmission line serving the future super-power zones of the West be reckoned as a common carrier? Such a ruling has already been made in connection with a recent suit decided in France. The suggestions here made by the professor of electrical engineering at the University of Washington carry the interest of a new idea into the problem of interconnection which is undoubtedly to be the trend of Western power development.—The Editor.)

Much valuable experience has lately been gained in the operation of extensive high tension systems. Due in part to new construction, but in most cases to electrical interconnection of two or more previously independent companies, the mileages of several transmission systems operating in synchronism have been greatly increased. In the past, independent long lines, connecting a hydroelectric power plant to some city or industrial load, formed the mile posts of progress. Thus the construction of the Big Creek line transmitting electric energy to Los Angeles, a distance of 242 miles, made both new high voltage and long distance records and was replete with new features of design. Lately the advance has been chiefly in the large mileage of high tension lines operating in synchronism, connected in a network spread over a great area or a chain of lines having a number of power plants and widely separated loads. For example: The Montana Power Company, in connection with the Chicago, Milwaukee & St. Paul Railroad, operates over a thousand miles of 100,000-volt transmission lines. In California, war time conditions forced several of the companies to interconnect and operate in synchronism. The recently completed 110,000-volt transmission line constructed by the Inter-Mountain Power Company in connection with the electrification of the Othello-Tacoma division of the C. M. & St. P. RR., formed a connecting link between the Washington Water Power Company in eastern Washington and the Puget Sound Traction Power & Light Company on Puget Sound. In August, 1919, when the interconnection was completed, the transmission lines of these companies and of the Pacific Power & Light Company were merged into a single synchronously operated system having approximately 1500 miles of transmission lines.

Advantage of Interconnected Systems

As an illustration of one of the advantages gained by interconnecting systems, it may be mentioned that in the fall of 1919, during the low water period on Puget Sound, approximately 10,000 kw. were taken from the surplus water power of the Spokane River and transmitted 262 miles to supply the deficiency in Seattle.

The experience gained in operating these extensive combined systems in synchronism is of great value. The evidence obtained is fairly conclusive that the operation of huge transmission systems presents no insurmountable difficulties; in fact, the increased mileage seems to be more of an asset than a liability for securing satisfactory operation.

That transmission systems having an even larger mileage of high tension lines operating in synchronism will be in general use in the future is certain. With the completion of the electrification of the western division of the C. M. & St. P. RR.—that is, by closing the gap between Othello, Washington, and Avery, Idaho—all the transmission lines from eastern Montana to Puget Sound will probably be operated in synchronism, as one electric unit. Similar extensions may also be made north and south along the Pacific Coast. By the construction of a few comparatively short sections of high tension lines all the larger power companies operating in British Columbia, Washington, Oregon, California, Idaho, Utah and Montana, at present totaling over 12,000 miles of transmission lines and over 2,000,000 hp. generator capacity, could be electrically united for synchronous operation as one system.

New Era in Power Transmission

However, the mere tying together of two or more systems that were designed and constructed to operate as independent units, can bring only a small part of the advantages that would be gained if the final scope of the system had formed the basis of the original design. The present interconnecting practice is mere patchwork, a temporary makeshift by which comparatively small advantage may be gained. Interconnection of transmission systems is chiefly important as a mile post of progress in that it shows we are on the eve of a new era in power transmission.

While the social and industrial unrest which naturally followed in the wake of the World War has temporarily delayed progress, it seems certain that in the near future the United States will enter on an unprecedented industrial development and intense industrial activity, which predicates a great increase in the electric power supply. Under the spur of international competition the production of each industrial workman must increase if American standards of living are to be maintained. The demand for power will be greater than the increase in the number of workers; for the assumptions seem to be justified that the output per worker is approximately in direct proportion to the power used, and that an increase in the use of power benefits both the workers and the employer.

With a rapid increase in the demand for power it becomes increasingly important that national economy be exercised in the conservation of the available power resources. By an extended use of

Is the only place for an easy chair in the dark corner of the room?

MAKE IT AN ELECTRICAL CHRISTMAS WITH A PORTABLE LAMP

electric power transmission very great economies could be effected.

(a) By the early development of all available water power. Every kilowatt developed is a kilowatt saved. More than 40,000,000 kw. are at present going to waste on our undeveloped water power sites.

(b) By the construction of very large central station steam plants as near as possible to the coal supply. With large units of high thermal efficiency very great economies could be effected. The transportation of the electric energy over trunk transmission lines would be more economical than the shipping of the raw material, coal, by rail. Such a system for the Atlantic seaboard was proposed in a paper read at the Boston meeting of the A. I. E. E. in March, 1919; and recently Congress appropriated the sum of $125,000 for a super-power survey of the Atlantic seaboard region.

(c) By the electrification of the railroads. There is no longer any question but that the electrification of trunk railroad lines is economically desirable. It has been estimated that an annual saving of 100,000,000 tons of high grade coal would be effected by this change.

(d) By a more general use of electrically driven machinery in the industries.

suggested system of trunk transmission lines for the three Pacific Coast states. Geographically, California forms a single natural power unit and the trunk transmission line should be located, as indicated on the map, in the Sacramento and San Joaquin valleys, extending practically the whole length of the state.

In Oregon the trunk line would be along the Willamette, Columbia and DesChutes rivers. For Washington the trunk system would be somewhat more complex as indicated on the map. In Fig. III more details are shown for the Puget Sound industrial region in western Washington.

The main trunk transmission line is drawn as a full line while the broken lines indicate laterals leading to the more important power sites. The figures indicate horsepower. The circles mark the location of power plants in operation, and the squares the undeveloped sites with figures showing the power

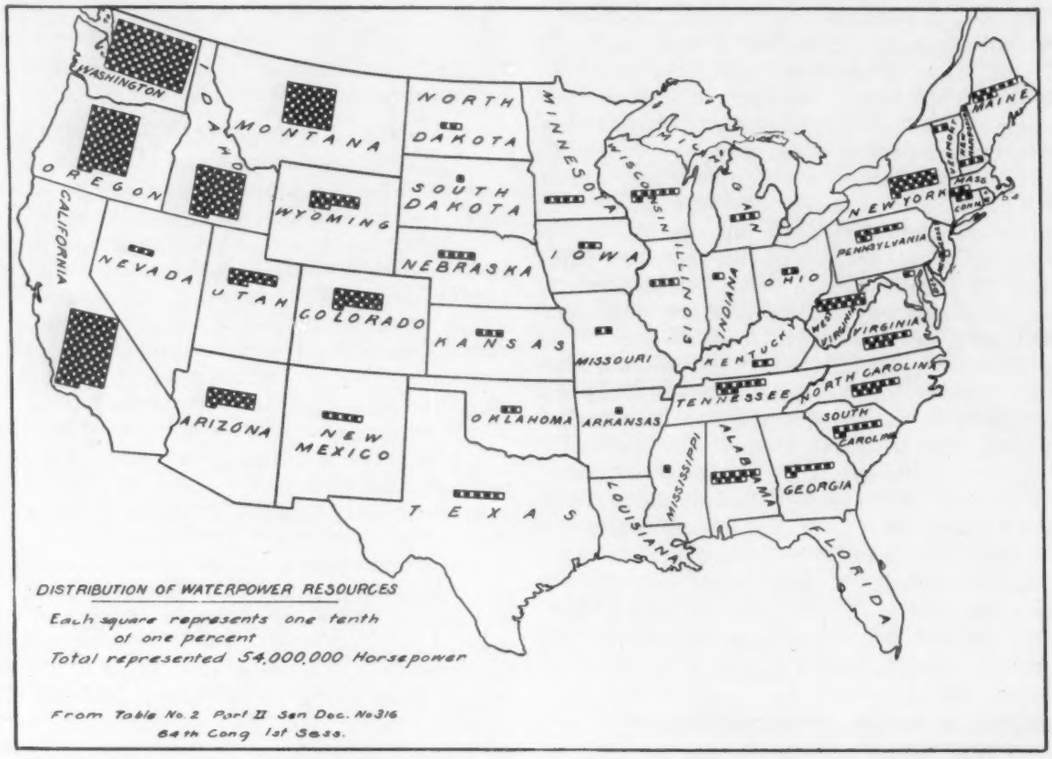


Fig. I.—The above map shows the distribution of water power resources of the United States amounting to 54,000,000 hp. The efficient and economical distribution of the electric energy derived from their development is one of the most important of national problems.

Future Power Developments

Even a casual consideration makes it evident that power developments in the future must be on a much larger and more comprehensive scale than in the past. Instead of a single power plant connected to a definite load at some far-away center by an independent transmission line, the natural geographic divisions must be taken as the basic units. This predicates the construction of trunk transmission lines to which all the power plants in a given region would deliver electric energy and from which all retail distribution systems would receive power. In Fig. II is shown the approximate location of a

now being wasted. The estimates are conservative and include only undeveloped sites where at least 10,000 hp. could be developed. By including smaller sites and developing storage facilities, the estimate of the available power for this region should be more than double that given in Fig. III.

Suggested Methods of Procedure

In order to plan wisely for the development of water power in any region, it is important to first determine the main outlines of a basic system suitable for the utilization of all the available power, although construction necessarily would consist of a

series of comparatively small unit additions extending over a long period of years.

From the engineering point of view, the design, construction and operation of extensive trunk lines or super-power systems offer no serious difficulties. All the engineering features of the proposed trunk line systems are well within the present state of the art; operating conditions can be predetermined and satisfactory results guaranteed. The insulation is generally considered as the weakest element in high

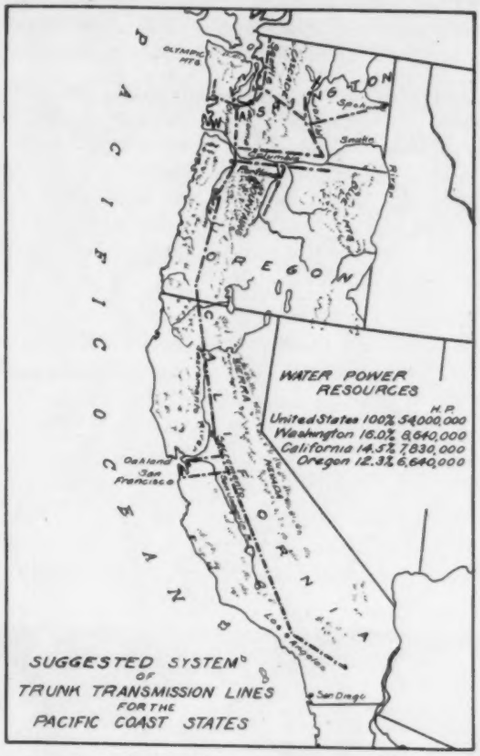

WATER POWER RESOURCES
H.P.
United States 100% 54,000,000
Washington 16.0% 8,640,000
California 14.5% 7,830,000
Oregon 12.3% 6,640,000
SUGGESTED SYSTEM OF TRUNK TRANSMISSION LINES FOR THE PACIFIC COAST STATES

Fig. II.—Approximate location of a suggested system of trunk transmission lines for Washington, Oregon and California.

tension transmission line designs, but recent investigations give conclusive evidence that insulators now in the market give adequate insulation up to 250 kv., which is greater than is required in the economical design of extensive trunk line systems.

However, the technical work of the engineer concerns only a comparatively small part of the whole industry. Administrative and legal problems of prime importance must be solved before any marked progress can be made towards the realization of super-power systems. Fundamental questions of ownership and control, regulation and management, and in fact most of the complex administrative problems of public utilities, will require new interpretations and solutions consistent with the imposed conditions.

In the creation of a super-system for any extensive region, as the Atlantic Seaboard or the Pacific Coast, it may be found advisable to form a new cleavage on the basis of the kind of service rendered, to limit the activity of each organization to a single business. Under present conditions, most electric power companies have a "Three in One" form of business organization—three distinct fields of industrial activity; manufacturing, transportation, and retailing of electric energy are covered by the same company.

Electric energy is a manufactured commodity. Generating stations are the factories; the product, being "perishable goods," is transported to market as soon as manufactured, over long distance transmission lines, and immediately delivered in retail to the individual customers over the low voltage distribution network.

Electric transmission lines are analogous to railroads in that "the service rendered is strictly distributive and of a public service order," although electric systems transport only a single commodity, electric energy. With extensive transmission systems covering several states, the transportation of electric energy may well come under laws of essentially the same characteristics as obtain for the railroads. Several years ago it was found necessary to limit the activities of the railroads to the transportation field. With power developments on a comprehensive scale, based on natural geographic divisions, it may likewise be advisable to make the transportation of electric energy an independent business, separate and distinct from the generation and distribution divisions.

VANCOUVER ISLAND
MAP OF WESTERN WASHINGTON
LEGEND
Developed Hydro-Electric Power Sites
Undeveloped Hydro-Electric Power Sites
Suggested Trunk Transmission Lines
Suggested Lateral Transmission Lines
Figures indicate horsepower that can be developed in blocks of 10000 or more

Fig. III.—Map of the suggested transmission systems of the Puget Sound industrial region of western Washington shown in greater detail.

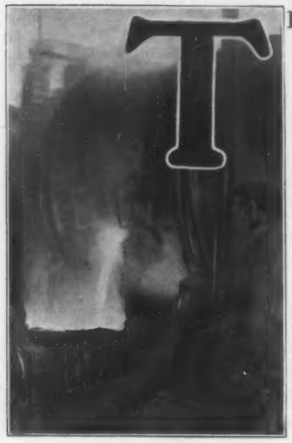
Does the laundry bring things home to you you never saw before?

MAKE IT AN ELECTRICAL CHRISTMAS WITH A WASHING MACHINE

Electricity for Brass Making in the Northwest

BY W. C. HESTON

(The high cost of metals and the shortage of fuel have been important factors in the rise of the electric furnace. Some of the specific advantages of the electric brass furnace are here presented by the industrial engineer for the Portland Railway Light and Power Company.—The Editor.)



Pouring a 3500-pound charge of manganese bronze for casting propeller blades.

THE electric brass furnace made its debut on the Pacific Coast early in 1920, when the Oregon Brass Works installed two electric brass furnaces, one of 1000 pounds capacity and the other of 2000 pounds capacity, in its foundry at Portland, Oregon. Although it has long been known that it was theoretically possible to eliminate a large part of the metal loss inherent to fuel fired furnaces, by the use of the electric furnace, it has only been within the last three or four years that the electric brass furnace has been developed on a commercial basis. The war, with the incident high cost and poor quality of crucibles, the high cost and shortage of important metals, and the demand for production at any cost, were factors which gave impetus to the electric furnace for melting non-ferrous metals.

The continued high price of all kinds of fuels has tended to accentuate the collateral advantages of the electric furnace and has placed it on a firm post-war basis.

The one great advantage of the electric furnace is the reduction of metal loss to an absolute minimum, the loss being 2 per cent or less as compared with 8 or 10 per cent in fuel fired furnaces.

Figures compiled by Dr. W. H. Gillett of the United States Bureau of Mines for the year 1914, show that in 3600 plants throughout this country, $200,000,000 worth of brass was melted with the value of metal lost beyond recovery not less than $6,000,000.

The furnaces at the country of the Oregon Brass Works are of the single-phase, indirect arc, rocking type, made by the Detroit Electric Furnace Company. The rocking of the furnaces causes the molten metal to wash four-fifths of the lining of the furnace twice each minute, thus giving a high thermal efficiency and a thoroughly mixed and homogeneous product.

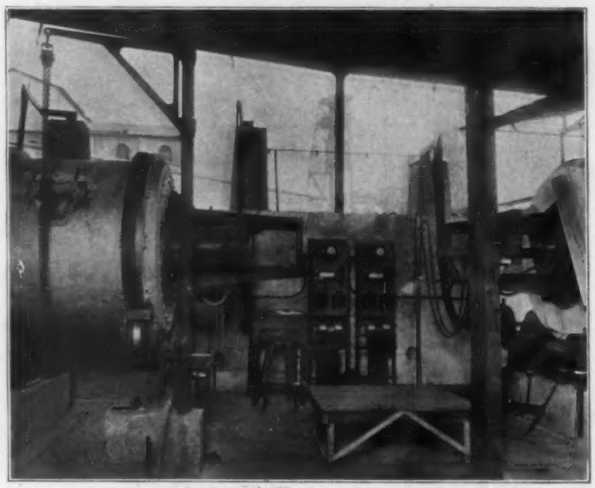
Current is supplied to the 1000-pound furnace by a 150-kva. transformer, and to the 2000-pound furnace by a 300-kva. transformer. Both are single-phase transformers rated, 11,000/115 volts. These transformers have an inherent reactance of 8 per cent and an external reactance of 20 per cent, with several taps by which the voltage across the arc may be varied. Current is conducted to the furnaces by copper busses extending through the top of the transformer vault and thence by flexible cables to the 4-in. graphite electrodes which are hand controlled.

Each furnace has a switchboard panel which has mounted on it in addition to the contactors for controlling the rocking motors, relays, oil switch controls, etc., an indicating wattmeter and a watthour meter, which is set back to zero each time a heat is started as the kilowatt-hour input into a charge is a direct measure of the temperature of the charge, and consequently indicates when the metal is ready to pour.

The results of the first two months operation showed the following costs per hundredweight:

Power	$0.259
Electrodes	0.031
Lining	0.040
	$0.330

The power consumption was 13.1 kw. per cwt., and the metal loss on some special runs where the weights were carefully checked, ranged from 2.34% on 15 heats of red brass borings to 2.81% on 8 sheets of manganese bronze, containing 41% zinc.



Electric Brass Furnaces at the foundry of the Oregon Brass Works, Portland, Oregon. The furnace shown on the left is 1000 pounds capacity and the one on the right 2000 pounds capacity. In the center of the picture may be seen the switchboards mounted near the substation wall, for controlling the current supplied to the furnaces.

Mr. W. F. Prier, president of the Oregon Brass Works, has always been a pioneer in his field, and the installation of the first electric brass furnaces west of the Mississippi river is only another indication of the progressive spirit of his firm.

The Fuel Oil Situation on the Pacific Coast

BY D. M. FOLSOM

(The fuel oil situation is one which has been engrossing the attention of engineers and leaders of industry for some time. The following paper takes up the question as it affects industrial progress on the Pacific Coast, pointing out that hydroelectric development is one of the most important solutions of the problem. The author is director of the Land Department of the General Petroleum Corporation.—The Editor.)

The fuel oil situation on the Pacific Coast can be viewed from three angles: from the viewpoint of the men within the oil industry itself; from the standpoint of the direct consumer, who in a sense corresponds to the middleman of other industries; or from the position of the great group of indirect consumers who make up the entire Pacific Coast community.

The first two groups have from their viewpoint a relatively short perspective. The question of immediate supply and demand, the success or failure of developments in new fields, the decline in field storage, and the price, seem of prime importance.

The third group is separated by a greater distance from the actual operations of the industry. From this longer perspective the questions of conservation and of future supply appear as the real problem.

The monthly reports of the State Mining Bureau show clearly that there is more drilling in the state today than ever before; and detailed study of the new locations show that every possible effort is being made, both to maintain production and to find new fields.

The immediate situation will always be critical, both for the producer and for the consumer. To them, oil is a commodity which is bought and sold on a daily market; and the pendulum of the market may swing rapidly from one side to the other.

The indirect consumer recognizes oil only in the form of transportation service, or in the form of a product manufactured through the use of oil. The situation does not change from day to day and from week to week. From his standpoint it follows a steady course, becoming constantly more critical.

Growing Consumption of Fuel Oil

The real interest of the community is, therefore, in a future supply of energy for the maintenance and expansion of Pacific Coast industries and transportation facilities. At present, the Coast is dependent upon oil for over 70% of the consumed heat and light and power; and oil production is not equal to the resulting demand. We have forced oil to carry more than its share of the burden of supplying energy, and the oil supply is no longer sufficient to carry this load.

That is the gist of the present situation. Consumption is overrunning production, and there is no prospect of new production sufficient to meet the growing demand. Furthermore, the increase in refinery output, to furnish an ample supply of gasoline, has reduced the proportion and quantity of fuel oil available from the crude output of the wells.

Take the present annual output of oil—100,000,000 barrels—as representing 100 units of energy. Then we have in the past twenty years consumed 1,200 units, and have as a reserve ahead of us underground 2,400 units; that is, a third of our visible supply of oil is exhausted. New fields may add somewhat to these estimated reserves, but the facts will still remain, that our supply has a limited life, and that the present rate of production cannot be long continued.

Now, as to the utilization of our 100 units of energy available from annual production; the oil industry within itself uses 8 units, and the products of our refineries,—gasolines, distillates, and lubricants—account for 17 more. This last represents the energy now consumed in automobiles, tractors, trucks, motor boats, and other internal combustion engines, which require high grade fuel.

Our fuel oil consumption each year equals 85 units and we have had to draw on stocks to make up a deficit of 10 units per year. In addition, we are facing from every side a rapidly increasing call for more energy. Not only do our present industries require additional oil, but new industries and new shipping are making insistent demands for fuel. Incidentally, the amount of fuel oil in storage now is not over 10,000,000 barrels—equal to the amount of our annual shortage, that is, 10 units of energy.

The Demands of Modern Industry

This is no artificial shortage which confronts the community. It is actual and immediate. Think what this means in terms of the future! Here in California we have had deposited to our credit a great reserve, invaluable as a natural resource, and unreplaceable when it is once withdrawn from the ground.

We have been living in a complicated industrial age, dependent upon transportation and manufacturing for our food and our clothing—and we have been forced to draw heavily on our reserves to meet our current needs. Instead of planning as a community to make the most of our resources, and to provide against their ultimate depletion, we have gone calmly ahead drawing on the bank without any idea as to where we shall turn when our drafts are no longer honored.

Obviously, this condition must end. We cannot continue to burn more oil than we produce, and we cannot continue indefinitely to count on even our present production. There can be only one answer to

Does your husband look like an accident victim after shaving?

MAKE IT AN ELECTRICAL CHRISTMAS WITH AN EXTRA BATHROOM LIGHT

the situation—some one who is burning oil today will have to use another source of energy tomorrow.

The real difficulty comes up when we try to decide which industries or what localities shall first give up oil. To attempt a priority list to give advantage to more essential use does not solve the question, as all consumption seems essential. For example: the 85 units of energy consumed each year are divided about as follows:

Railroads	34	units
Shipping, including Navy	16	"
Other Public Utilities	12	"
Metal, Lumber, Cement, & Chemical industries	12	"
Food industries	8	"
Heating	3	"

Roughly speaking, two-thirds of our fuel oil is used to provide energy for transportation, and upon this transportation we are dependent for our commercial existence. The Navy has demonstrated its absolute need for oil; the Shipping Board has publicly announced that it must have liquid fuel if it is to attempt competition with foreign boats; and the railroads, except to a limited extent in the Northwest, are absolutely dependent upon oil if they are to use fuel of any sort.

The public utilities use oil for the manufacture of artificial gas, and for the operation of auxiliary steam plants for the generation of electric power. During the past two years the power companies have been forced to carry a large part of their total load on oil, and even with increased hydro-electric development now under construction large quantities of oil will be required for stand-by service. There is no apparent chance to end the use of oil by public utilities.

The industries which are now developed in California, Oregon and Washington, cannot safely be penalized by forcing them to more expensive fuel, especially when these industries are not adequate to make the Coast self-contained and commercially independent. To wipe out our manufacturing would only add to the transportation burden, and increase the use of oil in another direction.

There is no solution through the priority restriction, except in outlying districts where coal in some form is available, and to a great extent this geographical curtailment is already in effect. The copper mines in Arizona, Nevada, and Utah, and many of the varied industries in Washington and Oregon, have already been forced back to coal; but offsetting this deliberate restriction of outside consumption the natural increase in demand here at home has absorbed this saving and has kept total consumption above the rate of production.

Hydro-electric Energy as the Solution

To my mind, there are only two possible solutions to the energy problem of the Pacific Coast: first, through the development of our water power reserves, and the substitution of hydro-electric energy for the burning of oil wherever possible; and, second, through the installation of internal combustion engines in the place of boilers and steam engines.

These steps must be taken sooner or later, and further industrial development on this coast must wait on their completion. It is obvious that we cannot increase our production of raw materials, nor operate new factories, nor increase our shipping, unless we have increased motive power.

The program for increasing hydro-electric development is not simple to carry out. It requires both time and money. But, difficult as the program may be, it must be undertaken and completed, unless we, as a community, are willing to see our industries and our commerce decline for lack of power. Regardless of the cost in money, regardless of the labor involved, and of the machinery and of the quantity of copper required, the potential power of the Pacific must be made available, and distributed to industries over a completely interconnected system of transmission lines.

It is not necessary here to consider the details of the substitution of one form of energy for another. In the end, hydro-electric power must replace oil on land, wherever it is possible to make the substitution. We cannot yet transmit electric current on sea, nor provide electric motive power for boats through storage, and oil must continue to be the natural source of energy for our shipping. In our boats, however, and on land wherever oil must be used, we must develop and install internal combustion engines in order to get efficiency in the use of our fuel.

Community Cooperation Necessary

There is nothing new in the program which I have outlined. It has long been recognized by engineers that it was an economic crime to burn up our limited supply of fuel, and at the same time neglect to develop the inexhaustible power contained in our mountain streams; and it has been common knowledge that engines of the Diesel type would virtually increase our fuel supply by making one barrel of oil do the work of three.

The present policy of the Federal Government makes it possible for public utility companies to get permits for power development, and it is strictly up to the community to get behind such development in every possible way. The successful completion of a program of development and substitution of electric power requires more than engineering skill. It requires constructive work on the part of every organization interested in the welfare of the Coast.

The greatest difficulty in the way of the power companies in undertaking this development is the matter of finance. We have been too anxious in the past to get our energy cheaply. We have virtually demanded of our public utility commissions that the rates be regulated and kept at a minimum. Now, if we want power for the future someone will have to pay for it. If we do not pay today, we will have to pay fourfold tomorrow, not only in actual money, but in loss of production and loss in trade consequent upon an actual power famine.

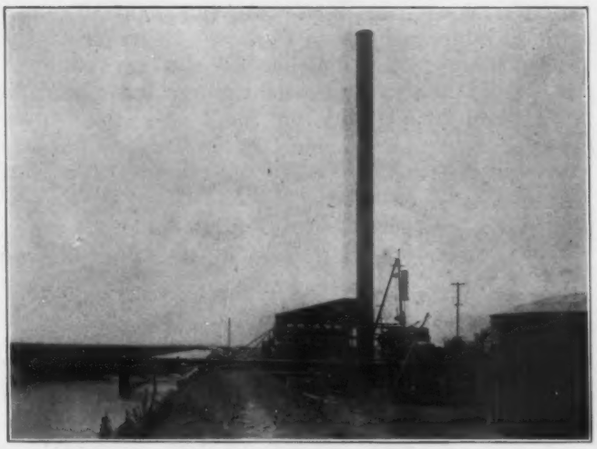
We must realize that the success of this program is vital to our prosperity, and that success can come only through the substantial encouragement of community support.

An Emergency Steam Plant for Rice Irrigation

BY RUDOLPH VAN NORDEN

(Forestalling a power shortage, where an insufficient supply of pumping power meant ruined crops, saved a large area planted to rice. The situation calling for this emergency plant was described in the previous issue, and the details of construction are given here in the concluding half of the article. The author is a well known consulting engineer in San Francisco.—The Editor.)

The steam plant contract called for an installation to accompany a 1,000-kw. a.c. turbo-generator, but with an additional payment specified should machinery be found to increase the capacity to



A view from the canal bank, taken about June 10. On the left is the main canal; on the right, the oil storage tank. The turbine is on the elevated structure with condenser and auxiliaries to the left. The heavy tackle behind the third boiler in the right background is in the act of raising breeching in place.

1,500 kw. An opportunity was presented for the purchase of a 1,000-kw. generating unit, then on the testing block at the Ridgway Dynamo & Engine Works, Ridgway, Pa., and this machine was contracted for. Within a few days, notification was received from the Ridgway representative that a 1,500-kw. unit which had been ordered was unexpectedly available owing to a change in the purchaser's plans, and quick action by telegraph secured this unit in place of the smaller one. Then the United States Shipping Board was appealed to for boilers, as it was known that great quantities of new marine equipment was available at many Government yards throughout the country. The necessary boilers were found in Oakland, where one of the 9,600-ton ships under construction was to be rearranged for a change from a cargo carrier to a refrigerator, after the boilers intended for the ship had already been delivered to the yard of the Moore Shipbuilding Company. These boilers were available and three of them were immediately purchased, as they fulfilled the requirements very nicely. The necessary boiler-feed pumps and a dry-vacuum pump were also purchased from the Shipping Board, also most of the necessary 4-0 copper conductor for the transmission line.

The principal pieces of apparatus and most of the equipment were quickly located and secured by April 1. Designs for the smokestack and the boiler breeching were made, and an order for their construction within strict time limits was placed with the Steel Tank & Pipe Company of Berkeley, and a 2,500-bbl. steel oil tank with the Western Pipe & Steel Company. In fact, all but a few small parts were ordered and assured practically before work on the ground commenced, with the notable exception of a condenser. Every effort to locate a condenser, either surface, or jet, seemed doomed to disappointment. Searches through the shipyards and Government yards were unavailing. Long lists of second-hand machinery were studied in the hope that some combination could be found that would do the work, and could be installed within the time available. Finally a second-hand dealer in Oakland produced a jet condenser of proper capacity, providing a suitable removal pump could be found. Eventually after many abortive plans to make use of old apparatus, C. F. Braun & Company in San Francisco undertook to build a pump within 30 days.

Equipment Lost in Transit

As soon as the generating unit was shipped, the boilers purchased, and the fittings under construction, or ready to ship, and matters had gone so smoothly that there seemed to be no doubt as to the final successful outcome of the enterprise, the unauthorized strike of freight handlers came along. The generating unit did not arrive and so far as any one knew, was lost. In spite of frantic appeals to the railroad company to trace and locate the shipment, not the slightest information was forthcoming as to the whereabouts of the car on which it was loaded. There were two other cars, one with transformers and another with a 300-hp. motor, both vitally necessary in the maintenance of the water on the rice crop. Then the contractor employed the Pinkerton Detective Agency in Chicago to find these cars, place an operative on each and stay with them until the destination was reached, but principally to keep them moving and moving fast. Within 24 hours after this order was given, the car with the turbo-generator was located at Ft. Wayne, Ind., among thousands of other cars, where it had rested for seventeen days. Twelve and one-half days after this car was located it was delivered at its destination. Almost as good time was made with the other two cars which proved to be even more completely lost than the first. But the strike was equally as effective in California, and the problem of moving the

Does the stranger at your gate have to search for the house number?

MAKE IT AN ELECTRICAL CHRISTMAS WITH A PORCH LIGHT

machinery and materials, so easily secured at home, appeared to be most difficult. The boilers in the Oakland yard could easily be loaded, also the other apparatus, but the railroads were unable to spot the cars.

One Advantage of a Railroad Strike

At Stockton the question of obtaining firebrick in quality as well as quantity presented another

Ninety-five days after the signing of the first contract the turbine was running, and the plant operated continuously throughout the summer.

snag. It was proposed to operate the boilers, should the necessity arise, up to 70 per cent above their normal rated capacity, and this would require heavy firing. No chance could be taken with the fire resisting linings of the furnaces and it was decided to use a special firebrick, known as "Gasco XX," developed by the Stockton Fire & Enamel Brick Co., as the result of the experience of E. C. and L. J. Jones in their patented gas generators, where the most severe conditions of alternating high temperature and cooling occur. It was at this point that the strike took on a beneficial aspect,—for while the manufacturers had a sufficient quantity of this brick, it was all on order and ready for shipment, but could not be moved on account of the strike. The manufacturer agreed to let the contractor have 22,000 of the brick, provided he could move them.

The contractor, by means best known to himself, secured a couple of cars which were spotted where they could be loaded, and by the time they were moved out the strike was sufficiently lifted to keep the cars going. About the same time, the Western Pacific managed to get cars into the Moore yard, and within a day or so they moved. Then everything began to arrive at once.

Installation of the Plant

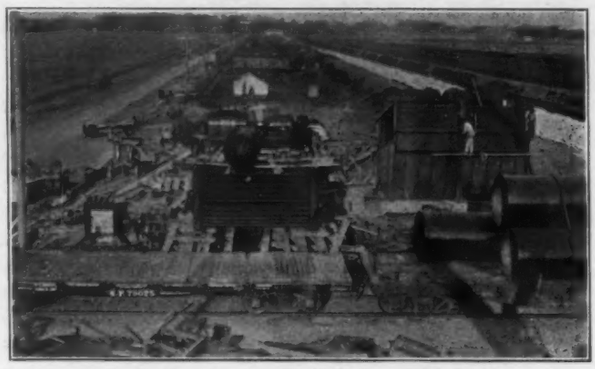
Meanwhile strenuous efforts were being made to get the foundation work started on the power plant. The deficiency in labor was acute. Only a small proportion of men who actually were obtained for the work would stay, and much of the labor obtained was of such poor quality that normal progress appeared to be impossible. High wages and the best of food and housing appeared to have no great attraction. Throughout the work from two to three hours overtime was paid almost every day. No attempt was made to erect a building until the plant should be complete and operating.

With all the many apparently insurmountable difficulties finally out of the way by June first, the plant began to assume the appearance of definite shape. On June 7, just ninety days after the signing of the first contract, steam was raised in the first pair of boilers, and on June 12 the turbine was running. There was still much to do in finishing up loose ends, and many petty annoyances developed, but the plant operated continuously from the 20th of June throughout the summer until the early rains in October brought relief to the power shortage situation. The object for which the plant was installed was fulfilled, the rice crop on the Provident and Maxwell Farms districts received a full quota of water without interruption, and what was by no means the least of the results to be obtained, the line voltage at the pumps was maintained at full value. Immediately upon completion, the plant was taken over under lease by the Pacific Gas & Electric Company and operated under their management throughout the season.

Description of Equipment

The generating unit, furnished by the Ridgway Dynamo and Engine Company, consists of a steam turbine of the Rateau type, a generator of the conventional enclosed induced-air-cooling type, and a direct connected exciter, all mounted on a heavy girder frame bedplate. The turbine has a maximum output of 2400 hp. and is operated at 3600 r.p.m. It is equipped with air and oil pressure governor, motor controlled, with automatic runaway stop. The high pressure glands are steam sealed and carbon packed, while the low pressure glands are water sealed and are packed by centrifugal action.

The generator is rated at 1500 kw., or 1850 kva., and will carry 10 per cent continuous overload based on a 55° temperature rise. The output is 3-phase and 60-cycle at 2400 volts. Air is drawn through the ends of the rotor and discharged through the center at the bottom and thence through a door in the side of the building. The incoming air enters a large box-like structure in which three sides and the



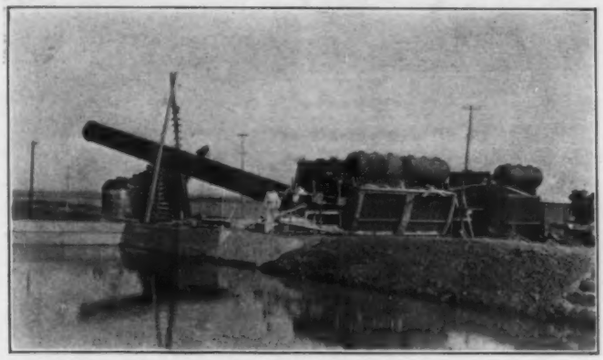
The plant is located close to the main canal of the Provident District, and the condenser cooling and boiler feed water is drawn directly from the canal.

bottom have cheesecloth covered screens with a superficial area of 144 sq. ft. This filter box is placed outside the building. A galvanized iron flue 4½ ft. wide by 24 in. deep conducts the cool air to the intake opening under the generator.

The switchboard consists of a single Westinghouse slate panel containing main circuit-breaker, a.c. and d.c. ammeters, voltmeter, indicating and integrating polyphase wattmeters, rheostats, etc. Three 3-kw. 2200-220-110-volt General Electric station transformers provide current for lighting and the operation of the oil transfer pump and a sump pump, of 5 hp. and 3 hp. respectively.

The main 2400-volt, 3-phase circuit passes from the switchboard through disconnecting switches and thence to a transmission line consisting of two circuits in parallel of 4-0 rubber covered strander copper. This circuit is carried a distance of ¾-mile to the Sidds Landing pumping plant.

The turbine and switchboard are mounted on an elevated concrete platform at a level 7 ft. 3 in. above the main station floor. The three boilers are placed



The smoke stack was shipped in three pieces, riveted together on the ground, and tipped up into place by the use of shear-legs and a heavy back-tackle.

in a line, two on one side and the third on the opposite side of the smokestack. Two horizontal breechings made of 3/16-in. steel plates and braced with steel angles, fitted with dampers, connect from the smoke openings on the tops of the boilers into the smokestack, on opposite sides. The smokestack is 101 ft. in height from the floor and 5 ft. internal diameter, and is built of 3/16-in. steel plates. The smokestack was shipped in three pieces, riveted together on the ground and tipped up into place by the use of shear-legs and a heavy back-tackle.

The boilers are the Heine standard cross-drum marine type, rated, on a basis of ten sq.-ft. heating surface per boiler horsepower, at 278 hp. each, and are not to be confused with boilers built on the Pacific Coast for the United States Shipping Board and known as "Heine type," or, "Foster," boilers. Each is equipped with a 42-in. cross-drum on which are mounted duplex safety valves, superheater and auxiliary 4-in. angle valves, 10-in. steam gauge, cocks, blow-off and double water inlets. These boilers are built in accordance with Lloyds, U. S. S. B. and A. S. M. E. standard specifications to carry 225 lb. working pressure. In this installation, 175-lb. pressure was adopted, and with this pressure it is possible to obtain a maximum of 100° superheat.

Especial attention was given to the design of the furnaces, aside from the careful selection of the insulating materials, in that an additional foot of furnace height was given over the standard design used on board ship. Inside the firebrick lining and between it and the steel shell is a layer of ½-in. asbestos millboard and 2½-in. thickness of silocel brick. The upper and lower baffles are of fire-clay tile, while the center baffle on two of the boilers is of segmental cast iron tile and on the third boiler is a ¼-in. steel plate. Each boiler is equipped with three G. H. Witt outside mix steam oil-burners, and these are supplied with fuel oil from a standard Witt double duplex steam pump set with exhaust steam oil-heater.

Oil and Feed Water Supply

In order to deliver fuel oil a spur track connecting with the Colusa & Hamilton branch of the Southern Pacific was installed. Oil cars are spotted over a concrete sump under the track. A 4-in. Gould rotary pump driven by a 5-hp. motor placed on the main station floor under the generator, convenient for attention from the operators and yet out of the way, pumps the fuel oil from the track sump into a 2500-bbl. fuel storage steel tank. There are two McGowan, simplex vertical Marine type, 10-in. by 6-in. by 12-in. boiler feed pumps, each having a capacity of 54 gal. per min., or sufficient to supply feed water for the full plant capacity. Warm water from the condenser discharge is delivered into an 800-gal. hotwell filter tank and from this tank the feed pumps force the boiler feed water through a Braun horizontal closed-type heater into the boilers. The plant is located alongside the main Provident District canal, and the condenser cooling and boiler feed water is drawn directly from the canal.

Steam Piping

There is a double system of steam piping, the one consisting of the main lines carrying superheated steam from the superheater outlets to the turbine, while the other is an auxiliary system taking saturated steam from the boiler drums and supplying all auxiliary apparatus. There is an emergency cross-connection between these systems of piping so that, in the event of superheater trouble, steam for the turbine may be drawn directly from the boilers. The superheated steam pipe lines are of 6 in., and 4 in., extra heavy welded steel pipe with VanStone joints and steel flanges. There are two 4 in., main Chapman steel-body gate valves equipped with Monel metal discs and seats, on each boiler feeder and one on the emergency crossover, making seven valves in all. The auxiliary steam lines are 4 in., extra heavy pipe, there being two high-pressure ferro-steel valves on each boiler lead. The piping, including long radius bends and VanStone (Cranelap) joints, was furnished and fabricated in San Francisco by the Crane Co., on a 30-day delivery contract, and it is of interest to note that this ma-

Do you have to get up early on frosty mornings to fix the furnace?

MAKE IT AN ELECTRICAL CHRISTMAS WITH AN ELECTRIC FURNACE REGULATOR

terial was shipped complete in 25 days after the order was received.

Exhaust steam, after leaving the turbine, passes through a 36-in. elbow, built of 5/16-in. steel plates, lap-welded to insure vacuum tight joints, to the condenser. A lateral outlet in this elbow terminates in an up-rise on which is mounted a 24-in. water-sealed atmospheric relief valve, above which is a 24-ft. length of 24-in. steel exhaust pipe. A Blake-Knowles jet condenser of the low-level counter-current type, receives cooling water from the canal and discharges it together with the condensate through its lower end into the removal pump, which is driven by a 60-hp., 2200-volt induction motor.

Design of Building

The building, which was erected after the plant had been placed in operation, is covered with galvanized corrugated iron. It has a high clerstory roof to facilitate ventilation. The framework is of timber, carefully designed to withstand the heavy winds which are sometimes experienced at this point. The roof trusses are of an unusual design in order to span the boiler breeching without giving undue height to the sidewalls. The order for six trusses was given to the Palm Iron Works of Sacramento on a Monday morning, after which they were detailed, the material ordered and received, the trusses fabricated and painted and delivered at the plant on a Saturday, twelve days later, after which they were assembled and erected without a change, or a misfit.

ARC WELDING OUTFIT FOR TAPPING WATER MAINS

To avoid the necessity of shutting the water off from customers who require it continuously for irrigation, the city of Los Angeles has turned to the use of an arc welding outfit for tapping mains. The set consists of a portable d.c. generator driven by a gasoline engine, the whole mounted on a motor truck.

Heretofore the practice has been to parallel the larger mains with smaller ones which could be shut off and emptied in order to make service connections. This was expensive and often it was necessary to shut off the mains up to 72 in. in diameter, drain them, with a loss of a large amount of water, and then make the service. Under the system now in effect the welding outfit is taken to the job and makes the connection in four hours' time, thus making a great saving in time and material.

The procedure is to turn down in a lathe and grind on an emery wheel the size of pipe desired. The end of the pipe is polished for two inches and beveled to an angle of 60 degrees. When taps to small diameter mains are to be made the service pipe is ground to fit the curvature of the main.

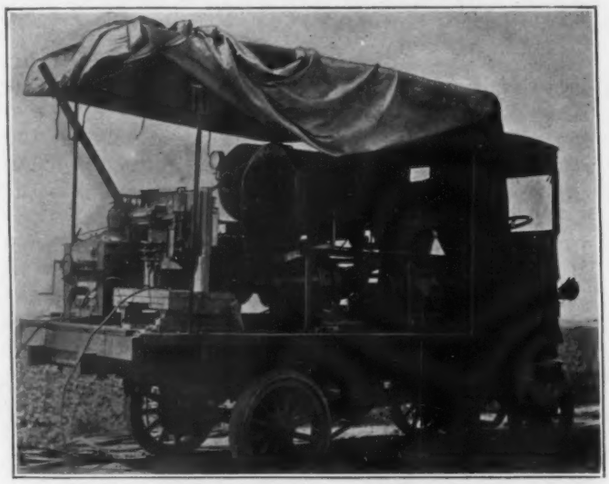
Before starting the job of welding the main is polished with an emery wheel to effect an easier bond. The coupling is then spot-welded and the first layer of metal applied. Considerable skill is required in handling the arc when depositing the first layer, but successive layers can be put on quite easily. The hole in the main is made in the usual way.

The welding unit consists of a 20-kw. d.c. generator driven by a six-cylinder gasoline engine which also drives an air compressor which supplies air for

Welding a 4-in. connection to a 60-in. riveted steel main. The picture was taken entirely by the light from the arc.

testing the connection after welding. The engine is supplied with a special governor to give the requisite steadiness in voltage. The panel on which switches and controls are mounted is built up on a small platform supported on wheels so that it can be taken to any desired part of the work.

The outfit was developed by S. B. Brown, an electrical engineer of Los Angeles. The above information as to the details of design and operation were supplied by H. A. Van Norman, assistant engineer of the Department of Public Service, City of Los Angeles.



Portable arc-welding outfit for making connections to water mains without draining the water from the mains.

LARGEST ROLLING MILL IS ELECTRICALLY DRIVEN

What is claimed to be the largest rolling mill in the world has recently been placed in service at Dorman & Long's Warrenby mills near Durham, England. The installation is electrically driven, involving 20,500 hp. in motors.

Problem Course in Electricity

BY H. H. BLISS

(Why must you have heavier service wires in your home if you install an electric range and a number of the large appliances? The following article, the tenth of a series, takes up the calculation of wire thicknesses and resistances. The author is on the staff of the Riverside Junior College at Riverside, California.—The Editor.)

WIRE SIZES AND RESISTANCE

Mils and Circular Mils.—Since nearly all electric wires are much less than an inch in thickness, it is not convenient to express their diameters and cross section areas in the usual units, inches and square inches. We use the "mil" as the unit of measure

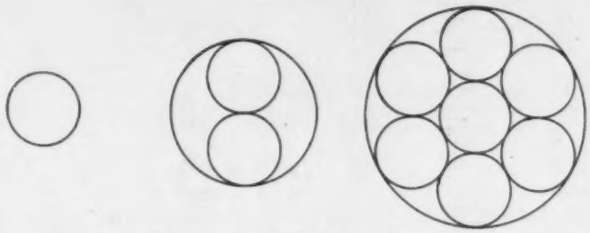


Fig. A.—Enlarged diagram showing that a circle 2 mils across has a much greater area than two one mil circles.

for diameter, one mil being 1/1000 of an inch just as one "mill" represents 1/1000 of a dollar in our monetary system. Then a half-inch wire is said to have a diameter of 500 mils; 1/10 of an inch is 100 mils; .037 inch = 37 mils.

If a one mil wire were cut square across it would present a circular cross section of which the area is said to be one "circular mil." The circular mil thus defined serves as the unit of cross section area in all wire computations.

If a wire 2 mils in diameter were cut across, would it present an area of 2 C. M. (circular mils)? The enlarged diagram of Fig. A shows that a circle 2 mils across has an area much greater than two one mil circles; in fact it contains as much as four circular mils. The three mil circle contains 7 complete circles of one mil diameter with enough extra space to equal two more. The general rule is that the C. M. area of any circle equals the square of its diameter (this last being, of course, expressed in mils). Thus, No. 30 wire which is 10 mils thick has a section area of $10^2 = 100$ C. M.

What is the area of a wire ¼-inch in diameter, and what is the diameter of a wire with twice that area? Since ¼-inch = 250 mils, the first answer is $250 \times 250 =$ **62,500 C. M.** Then $2 \times 62500 =$ 125,000 and the diameter of the second wire is the square root of 125,000 = **354 mils.**

Resistance of Copper Wires.—If nine one-mil wires were laid together into a cable, it would have a cross section equivalent to that of a wire three mils in diameter. A three-mil wire, then, has the same resistance as 9 one-mil wires in parallel, or 1/9 the resistance of one of them. Similarly a wire of 26,250 C. M. area (No. 6) has a resistance of 1/26,250 of that of a one-mil wire of the same length.

Hence, to find the resistance of any wire, divide the resistance of an equal length of 1 C. M. wire by the C. M. of the given wire.

A piece of copper wire of 1 C. M. cross section and 1 foot long has a resistance of about 10 ohms at a temperature of 50° F. Therefore the resistance of any length of such wire = 10 × the number of feet, since each separate foot is in series with all the others. The relations of length and size to resistance are conveniently expressed as follows:

For any copper conductor the resistance is approximately equal to 10 × the length in feet ÷ the cross section in C. M.

Rectangular Conductors.—In Fig. B are shown conductors of shapes different from the round form usually met with. Square, rectangular and flat conductors are used in winding armatures and field coils, for bus bars and for other carriers of heavy currents for short distances. The resistances of such con-

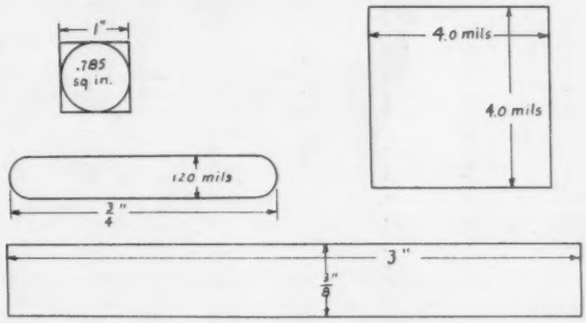


Fig. B.—In this cut are shown square, rectangular and flat conductors which differ from the more familiar round form.

ductors must be calculated from section area and length.

Since any circle has an area .785 as large as that of a square of the same dimensions (see Fig. B), one circular mil is .785 of one square mil. The square conductor in Fig. B has an area of $40 \times 40 =$ 1600 sq. mils; 1600/.785 = 2040 C. M. The ⅜ in. × 3 in. rectangle (the cross section of a bus bar in a power house) has $375 \times 3000 =$ 1,125,000 sq. mils or 1,432,000 C.M. The remaining shape in Fig. B may be analyzed as a rectangle plus a circle; its area = $120 \times 630/.785 + 120^2 =$ 110,700 C. M.

Is your wife nervous over the possibility of a man under the bed?

MAKE IT AN ELECTRICAL CHRISTMAS WITH AN ELECTRIC BURGLAR ALARM

Wire Table.—Below is a table giving the most important figures relating to round copper wires of various sizes from No. 0000 to No. 40. The resistances are given for wires at a temperature of 68° F. and these figures are not exact for any other temperature. All metallic wires increase in resistance as they become warmer. The attached list of multipliers will enable one to correct the tabulated figures for various temperatures up to 200° F. The ohms per C. M. foot for copper wire at these temperatures are also given. It will be noted that this number rises to 12 ohms before the temperature reaches 150°. Hence design calculations are often carried out on a basis of 1 ohm per C. M. inch.

WIRE TABLE

			COPPER				ALUMINUM				
Gage Number B&S	Diameter in Mils	Area in Cir. Mils	Ohms per 1000 Feet	Lbs. per 1000 Feet	Safe Amps. Other Ins'n	Safe Amps. Rubber Ins'n	Ohms per 1000 Feet	Lbs. per 1000 Feet	Safe Amps. Other Ins'n	Safe Amps. Rubber Ins'n	Gage Number B&S
0000	460.0	211600	.0489	640.5	325	225	.0804	192.0	273	189	0000
000	409.6	167800	.0617	508.0	275	175	.1014	152.3	231	147	000
00	364.8	133100	.0778	402.8	225	150	.1278	120.8	189	126	00
0	324.9	105500	.0981	319.5	200	125	.1610	95.9	168	105	0
1	289.3	83690	.1237	253.3	150	100	.2032	76.0	126	84	1
2	257.6	66370	.1560	200.9	125	90	.2562	60.2	105	75	2
3	229.4	52630	.1967	159.3	100	80	.3230	47.8	84	67	3
4	204.3	41740	.2480	126.4	90	70	.4075	37.9	75	59	4
5	181.9	33100	.3128	100.2	80	55	.5140	30.0	67	46	5
6	162.0	26250	.3944	79.46	70	50	.6480	23.8	59	42	6
7	144.3	20820	.4973	63.02			.8171	18.9			7
8	128.5	16510	.6271	49.98	50	35	1.050	15.0	42	29	8
9	114.4	13090	.7908	39.63			1.300	11.9			9
10	101.9	10380	.9972	31.48	30	25	1.640	9.42	25	21	10
11	90.74	8234	1.257	24.93			2.068	7.47			11
12	80.81	6530	1.586	19.77	25	20	2.605	5.93	21	16	12
13	71.96	5178	1.999	15.68			3.284	4.71			13
14	64.08	4107	2.521	12.43	20	15	4.250	3.73	16	12	14
15	57.07	3257	3.179	9.86			5.111	2.96			15
16	50.82	2583	4.009	7.82	10	6	6.591	2.34	8	5	16
17	45.26	20.48	5.055	6.20			8.315	1.86			17
18	40.30	1624	6.374	4.92	5	3	10.49	1.47	4	2.5	18
19	35.89	1288	8.038	3.90			13.60	1.17			19
20	31.96	1022	10.14	3.08			16.66	.929			20
21	28.46	810	12.78	2.45			21.03	.737			21
22	25.35	642	16.12	1.95			26.51	.581			22
23	22.57	509	20.32	1.54			33.42	.464			23
24	20.10	404	25.63	1.22			42.15	.367			24
25	17.90	320	32.31	.970			53.17	.291			25
26	15.94	254	40.75	.769			67.05	.230			26
27	14.20	201	51.38	.610			84.50	.183			27
28	12.64	160	64.79	.484			106.5	.144			28
29	11.26	127	81.70	.384			134.4	.116			29
30	10.03	100	103.0	.304			169.3	.991			30
31	8.93	80	129.9	.241			208.6	.072			31
32	7.95	63	163.8	.191			269.5	.057			32
33	7.08	50	206.6	.152			339.6	.045			33
34	6.31	40	260.5	.120			428.5	.036			34
35	5.62	32	328.4	.096			540.0	.029			35
36	5.00	25	414.2	.076			681.0	.023			36
37	4.45	20	522.2	.060			858.9	.018			37
38	3.97	16	558.5	.048			1084	.014			38
39	3.53	12	830.4	.038			1366	.011			39
40	3.15	10	1047.0	.030			1722	.009			40

Temperature of Wire	80°F.	90°F.	100°F.	150°F.	200°F.
Multiply res. at 68° by	1.024	1.044	1.064	1.164	1.264
Ohms per C. M. ft. copper	10.65	10.87	11.08	12.11	13.17

Using the Table.—To find the resistance of a piece of wire of any length, find the ohms per 1000 ft. from the table and divide by 1,000 (simply move the decimal point three places to the left). This gives the resistance of one foot of wire. Multiplying by the length of wire (in feet) gives the resistance.

For example, the resistance of 700 feet of No. 4 copper wire = 700 × .000248 = .1736 ohms. And 25 feet of No. 22 copper wire will have a resistance of 25 × .01612 = .403 ohms.

How long a piece of No. 30 copper will be needed to make a resistance of 8.446 ohms? One foot has .103 ohm (from table); hence 8.446/.103 or 82 feet is the length required.

What size copper wire should be used if the resistance of 150 feet is not to exceed .111 ohm? The ohms per foot = .111/150 = .00074; hence there is .74 ohm per 1000 feet. Referring to the table we see that No. 9 has .7908 ohm per 1000 feet, and No. 8 has .6271. Evidently No. 9 has **too much** resistance. Answer, **No. 8.**

In such problems always select wire of the next size **larger.**

A motor taking 40 amperes is 208 feet from the generator. What size copper wire is needed if the line drop must not be greater than 6 volts? The resistance must not exceed 6/40 or .15 ohm. Noting that we must use 2 × 208, or 416 feet of wire, we see that the ohms per 1000 ft. = 1000 × .15/416 = .361 ohm. Hence we select No. 5 with .3128 ohm per 1000 ft., as No. 6 has too high resistance (.3944).

Solutions of Previous Set

98. At 40,000 it takes 12,500/80 = 156 times as many ampere-turns for air as for cast iron, hence the cast iron has permeability = **156.** At 70,000 wrought iron has **1608,** cast steel has **1045,** sheet steel has **2090.**

99. Half way between 40 and 80 is **60 ampere turns** for the cast iron. For the cast steel, .8 of the difference between 28 and 43 is 12, and 28 + 12 = **40;** for the sheet steel, .2 of the difference between 32 and 80 is 10, and 32 + 10 = **42.**

100. Armature: density = 90,000; 3 × 43 = 129 ampere-turns. Air gaps: density = 45,000/.7 = 64,300; 2 × .025 × 64,300/3.2 = 1003 ampere-turns; magnet: density = 1.55 × 64,300 = 100,000; 8 × 80 = 640 ampere-turns. Total = **1772 ampere-turns.**

101. Area = 1.54 sq. in.; density = 78,500/1.54 = 51,000. Pull = 1.54 × 51,000 × 51,000/72,000,000 = **55.6 lbs.**

102. Area = .95 sq. in.; density = 78,500/.95 = 82,600. Pull = .95 × 82,600 × 82,600 ÷ 72,000,000 = **90 lbs.**

103. Air gaps: area = 3.14; ampere-turns = 750. Armature: density = 83,300; ampere-turns = 6 × 22 = 132. Poles: ampere-turns = 20 × 18 = 360. Yoke: density = 35,000; ampere-turns = 6 × 60 = 360. Total = **1602 ampere-turns.**

104. Poles: density = 91,000; ampere-turns = 20 × 34 = 680. Yoke requires 6 × 80 = 480 ampere-turns. Armature and air gaps as before. Total = **2042 ampere-turns.**

105. Area = .675 sq. in. Density × density = pull × 72,000,000/area = 15 × 72,000,000/.675 = 1,600,000,000. Hence density = **40,000** and total flux = **27,000 lines.**

106. Gaps need 2 × .02 × 12,500 = 500 ampere-turns. Armature needs 4 × 103 = 412; gaps and armature need **912 ampere-turns.**

107. 2730 — 912 = 1818 ampere turns required to drive the flux 13 in. through the cast iron, or 140 ampere-turns per inch. From the table, this indicates a flux density of 50,000. Leakage coefficient = 50,000/40,000 = 1.25.

108. A guess that the total flux = 160,000 gives ampere-turns = 1302. A revised estimate of 200,000 gives 2210 ampere-turns, the correct number. Hence the answer is **200,000.**

Copper Wire Problems

109. What are the section areas of round wires of the following diameters: 60 mils, ¼ inch; 2.2 inches?

110. Find the diameter of a special copper wire 4000 ft. long, which has a resistance of 400 ohms at 50° F.

111. What is the resistance at 80° F. of a copper wire .3-inch in diameter and 7300 feet long?

112. Find the section area in sq. mils and C. M. and the resistance per 1000 ft. of a rectangular copper conductor 1/16 in. by 7/8 in. (Assume 50° F. in this and similar cases where temperature is not stated and tabular figures are not available.)

113. A square wire 860 ft. long has a resistance of .3 ohm. Find section area and thickness of the conductor.

114. What is the diameter of a round wire 5 in. long which has a resistance of .0745 ohm?

115. Find the resistance of 1000 ft. of No. 16 copper wire at 90° and 200° F.

116. What is the length of a piece of No. 2 copper wire which has .0343 ohm resistance at 68° F.?

117. Find the gage number of a copper wire 370 ft. long which has 24 ohms resistance at 68°.

118. 250 ft. from a 104-volt generator is a 10-hp. 100-volt motor of 75% efficiency. What size copper should be used for transmitting the current?

119. Each of the three conductors in a copper cable across the Golden Gate contains 250,000 C. M. in 37 strands. Find the diameter and resistance of one strand, the length being 26,775 ft. and the temperature 50° F.

120. What is the voltage between a pair of No. 13 copper wires 26,775 ft. from an applied voltage of 40, if the current flowing is .3 ampere? (Assume 68° F.)

121. A magnet coil has an average diameter of 4.2 in. and contains 360 turns of No. 18 wire. Volts applied to coil = 22. The temperature being 100° F., find the ampere-turns and the watt loss in the coil.

Pamphlets and Clippings in a Business Library

BY VIRGINIA FAIRFAX

(Are you wondering what to do with that ever-growing collection of clippings and pamphlets? The librarian of the Carnation Milk Products Company makes their segregation a simple matter if instructions are followed. Permission to reprint from this series must be obtained from the Journal of Electricity.—The Editor.)

THE FILING EQUIPMENT NEEDED

In order properly to install vertical files of pamphlets and clippings, it is most economical and satisfactory to purchase at the start the filing equipment and supplies that, through use and experience in business libraries, have been found most satisfactory.

The requirements are, one or more filing units, or filing cabinets; substantial folders, heavy manila envelopes and possibly a set of guides; 3 by 5 inch catalog or index cards; a 3 by 5 inch card tray cabinet to hold the cards, and gummed name labels for marking the folders.

Vertical Unit Cabinets

The vertical files are built in units, three or four drawers high with removable sides so that the files may be expanded by the addition of other units as the collection of pamphlets grows. These filing units or cabinets, adequate for filing pamphlets and clippings, may be purchased in two sizes. The correspondence size drawers are 10½ inches high, 12 inches wide and 24 inches deep, inside measurements. The legal size is much more desirable for pamphlets and clippings because this size drawer gives more filing space, in that the average size pamphlets stand side by side in an upright position, without lapping, and the large pamphlets or oversize booklets are accommodated as well as reports on legal size paper, without folding. Correspondence size units occupy less floor space but the drawers do not hold as much material as the legal size, and more drawers of the correspondence size are eventually required. Therefore there is no saving either of floor space or of money by the purchase of the smaller size.

Vertical filing cabinets are manufactured in wood and steel by all of the well known manufacturers of office equipment and supplies, such as the Library Bureau, Yawman & Erbe Manufacturing Company, the Globe Wernicke Company, Shaw Walker Company, Art Metal Construction Company, The Macy Company, etc. There is no advantage in purchasing steel files for material of this character, unless floor space is very limited. It is claimed that a half-inch is saved on every steel unit over the wood units. Wood files harmonize better with the other office furnishings and are less noisy when the

Do you have to walk upstairs in the dark to reach the light switch?

MAKE IT AN ELECTRICAL CHRISTMAS WITH A THREE WAY SWITCH

drawers are pulled and pushed back and forth, and are less expensive. The points to bear in mind in selecting the make of wood vertical files are to have them of well seasoned wood, perfectly dried, so that there will be no swelling or warping, and the drawers in either wood or steel cabinets should be mounted on roller-bearing slides so that they run easily when loaded.

Size and Quality of Folders

Folders for holding the pamphlets, and clippings too if they are not collected in great quantities, may be had in several qualities. They are made of pressboard, of manila paper and of a fiber material that is very tough and durable. The pressboard folders are made to order by any of the manufacturers of office and library supplies or any paper house, either straight edge or with tabs, and should be cut, if legal size files have been purchased, 14½ by 10 inches with a one-inch linen bellows expansion at the bottom, the front edge of folder a half-inch shorter than the back. These make a very substantial receptacle and wear indefinitely.

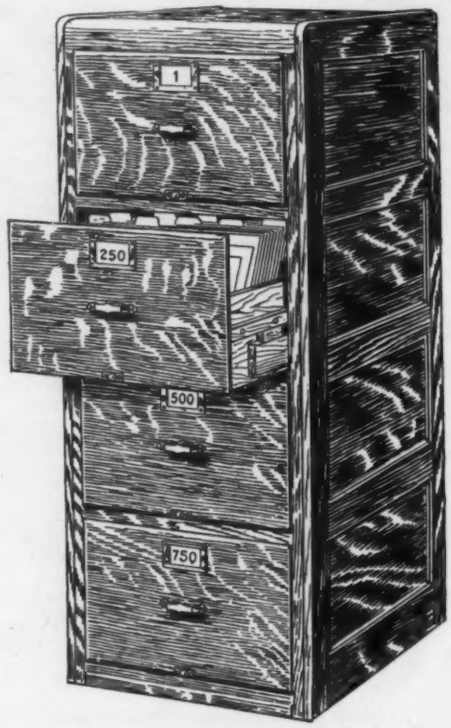
The Yawmanote Filing Pockets are made of a durable fiber material and have a bellows expansion of different widths at the bottom and about halfway up each side, making as the name implies, a a pocket. These are manufactured in legal and correspondence sizes by Yawman & Erbe Manufacturing Company, Rochester, New York.

Yawmanote Filing Pocket, legal size, showing bellows at bottom and sides. Courtesy of Yawman & Erbe Manufacturing Company.

The Bushnell Vertex Paperoid File Pocket, made by the Alvah Bushnell Company, Philadelphia, Pa., and the jute and leatherette folders and pockets made by the Library Bureau are similar to the Yawmanote filing pockets. Any of these pockets are excellent and like the pressboard folders will hold a great deal of material without sagging or getting out of shape. Manila folders may be used to hold a few pamphlets or until the collection on any particular subject grows, when the contents can be transferred to a heavier folder. The manila folders are much cheaper than these others, but they are far less durable; they sag in the file drawers and will not hold nearly as much material. They are useful, however, for a small amount of printed matter and save the more expensive folders until the collection of material warrants their use.

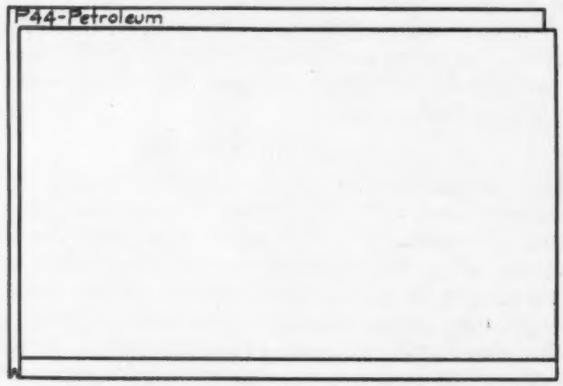
Binder folders are useful for holding together manuscripts consisting of a number of pages. These are light weight manila folders to which fasteners are affixed, either at the top of the folder or at the center alongside of the fold, and bind the papers in book form. The Acco Fasteners, made by the American Clip Company, New York City, may be purchased by the box or already fitted into folders. From the Library Bureau may be purchased folders already fitted with the L. B. metal fasteners, which are similar to the Acco fasteners.

Articles of only several pages clipped from periodicals, or typewritten reports of a few pages, may



The legal size unit may be expanded by removing the sides and adding other units. Courtesy of Library Bureau.

be bound with a manuscript cover paper and clamped together, or they may be fastened into light weight manila folders with U-File-M binder strips. This latter fastener is a strip of gummed paper that is glued into the folder and has little tabs that project and are glued on to the sheets to be inserted. These hold the sheets one behind the other, like leaves in a book. They may be purchased from U-File-M Man-



Legal size pressboard folder, straight edges with one-inch bellows at bottom

ufacturing Company, Syracuse, New York. On the front cover of any of these binders should be written, or typed, the name of the article, its source and date of publication and the bound article dropped

into the heavy folder with the other material on the same subject.

This method of caring for clipped articles and manuscripts requires but a few minutes and increases the length of their durability and helps to make the files neat and a joy to use.

Envelopes Desirable for Clippings

If a great many clippings are collected it is better to keep them in heavy manila envelopes, the same size as folders, and file them immediately behind the folder holding pamphlets on the same subject. The envelope prevents unmounted clippings from slipping out into the drawer and becoming mislaid or lost. If the clippings are not numerous they should be mounted on a substantial paper, light weight manila or bond that does not tear or crumple easily, and filed in the folder with the other material on the same subject.

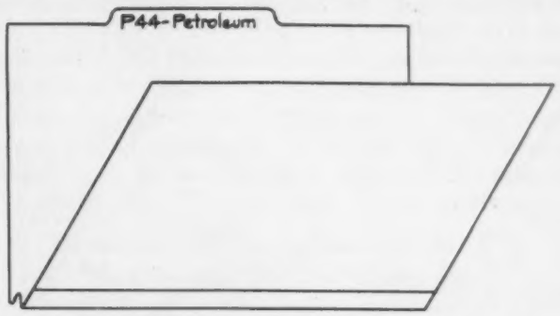
Gummed Name Labels

The gummed name labels may be purchased in five different colors. They come approximately four inches wide, ten labels to a strip, 1000 strips in a box, ruled for folding and cutting and gummed for sticking. Before cutting they may be run through a typewriter and subject name printed on them ready for pasting on the folder. These may be bought from the Library Bureau.

The Use of Guides

Two systems may be used to arrange, in the file drawers, the folders or pockets and envelopes containing the printed matter. First, in a small collection, guides are not necessary as the stiff pressboard folders or pockets already described, cut with straight edges and plainly marked with the subject name on the upper left hand margin, stand out plainly and are easily found. Second, where the collection is large, that is, when a number of vertical filing units are required to house the collection, guides are used to facilitate the filing and finding of the printed matter.

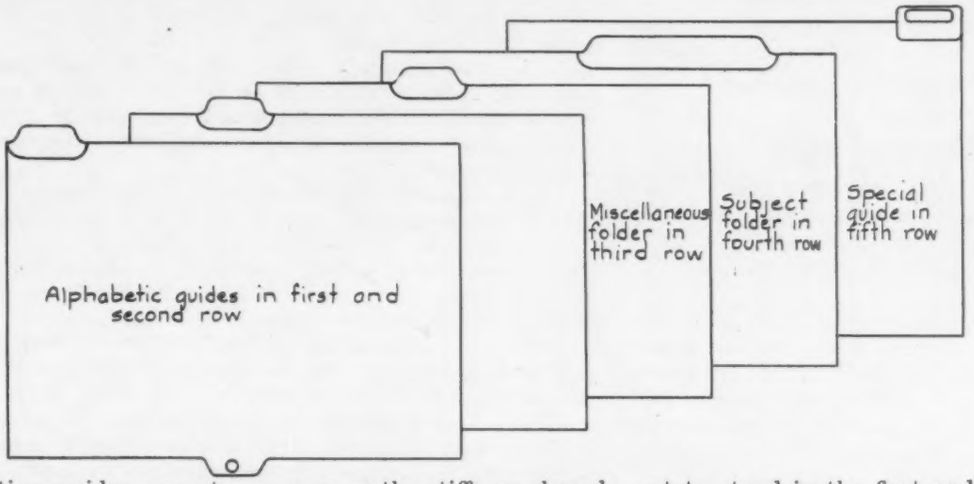
In this latter system pressboard guides with the alphabetic divisions printed on their tabs, or projections, are best arranged in two rows at the extreme left of the file drawer, that is, the tabs are cut to stand in the first and second positions. Miscellaneous folders, when used, should have tabs projecting in the third row (the use of miscellaneous folders



Legal size pressboard folder with tab and one-inch bellows at bottom

will be explained in the next article). The folders for holding the printed matter should have wide tabs projecting in the next or fourth row and these folder tabs should be marked to indicate their contents and the folders filed behind the correct alphabetic guides. If special subject guides are required they may have tabs projecting in the fifth row, that is, at the extreme right of the file drawer.

In some business libraries it is desirable to arrange the information in the vertical files according to country. Under these circumstances, and if the collection is large, the pressboard guides with tabs cut to project in the middle row, center of drawer, have the country name printed on them. Behind each country guide the tab folders, with tabs cut to stand in the first and second row, should be marked with the subject name of contents and arranged in alphabetical order. For example: a guide with tab in center position may be marked FRANCE. The first subject folder with tab in first position,


Alphabetic guides in first and second row
Miscellaneous folder in third row
Subject folder in fourth row
Special guide in fifth row

The tabs with alphabetic divisions should project in the first and second positions, miscellaneous folders in the third, printed matter in the fourth and special subject guides at the extreme right.

Does the baby turn on the gas stove when your back is turned?

MAKE IT AN ELECTRICAL CHRISTMAS WITH AN ELECTRIC RANGE

extreme left hand side, may be marked "Advertising." The second subject folder with tab cut in second position may be marked "Exchange & Credit Conditions." The third subject folder with tab in the first position may be marked "Tariffs," etc., meaning in each instance as related to France.

If a miscellaneous folder is used, it should have tab standing in the fourth row, and should be filed behind the last subject folder containing information on that country, and just in front of next country guide, which in this instance may be Germany.

Card Trays and Card Tray Cabinets

A good quality of card approximately 3 by 5 inches should be purchased, preferably of linen stock whose edges will not become soft from frequent fingering, and light enough to run through a typewriter and record made thereon. Punched cards that allow for a rod to pass through are preferable as the rods prevent spilling of contents and careless removal of cards from the trays. By no means should more than one weight of card be used in the catalog or index and to assure proper fit, cards and card tray cabinets should be purchased having same standard of measurement. That is, some manufacturers cut their card stock and make their card trays with the centimeter, and also with the inch, as a basis of measurement, and others with only the inch as a basis. The slight difference between the centimeter and the inch will cause a great deal of annoyance in fingering cards or an absolute misfit in card trays not made to the same measure. Therefore the measurement desired must be specified and adhered to.

Card tray cabinets may be purchased with one, two or more drawers from any of the manufacturers of office equipment and supplies.

TESTING ELECTRIC WELDS

The question of testing welds was interestingly treated in a paper read recently by S. W. Miller before the Chicago Section of the American Welding Society. Some of the points brought out were as follows:

Soundness in a weld means freedom from mechanical imperfections such as lack of fusion, the presence of films or other inclusions, gas pockets, slag, etc. While no one method of test shows everything desired to be known about a weld, the microscope is particularly valuable in investigating the formation of metals, and therefore of a weld, which is subject to all the defects found in castings.

It is not universally known that a comparatively small difference in the percentage of carbon in the material being welded makes a very great difference in the results of either a bend or a tensile test. The higher the carbon the more difficult it is to get a satisfactory weld, and the more danger there is of injuring the metal being welded. A weld made with a given welding rod or electrode can have only a given strength. If this strength is greater than that of the material being welded, the test piece will always break outside of the weld. If, on the other hand, the weld is weaker than the material being welded, the rupture will always take place in the weld.

The method of test to be applied in any given case depends largely on the use to which the welded piece is to be put. One of the best tests to determine quickly the general character of a weld is to grind it off level with the surface of the pieces and clamp it on an anvil, the bottom of the V toward the anvil so that the top of the weld is stretched when the projecting end is struck with a sledge. The blow should not be too heavy, and the number of blows and angle to which the piece bends before cracking are quite a good index of the value of the weld. It is true in this test as in the tensile tests, that the quality of the material being welded has a great influence on the results, stiff material throwing off more of the strain into the weld, while soft ductile material will itself take considerable of the bend. In the case of defective welds, those not fused along the V or which contain slag or other inclusions, this test will at once develop defects. If a welded piece were to be used in a place where it might become red hot, it would be entirely proper to test the weld at a good red heat. If welds are made in half-inch by two-inch bar steel, a 90 degree single V being used, and they bend to a right angle cold without cracking on the outside, a welder may feel well satisfied with his work.

In many cases, the defects in welds are easily visible to the naked eye when tested. In other cases they are not. There has recently been developed an etching method for testing steel rails for hidden defects. For instance, a section of a weld might be cut out with a hack saw, machined or filed to a true surface, and polished on various grades of emery paper. It is then placed in a warm solution of 25 per cent hydrochloric acid and water for about an hour. The acid will eat away the defects, making the edges of the material taper, so that rather large grooves and pits will be visible where the defects prior to the etching would be only microscopic.

Some of the defects in welds are visible under the microscope but others are not visible until the weld is strained. A small bending machine that can be placed on the microscope stage is very useful, because after etching the piece can be bent and examined to see the effect of the strain. In the case of bare wire electric welds, the ruptures seem always to occur at the grain boundaries, even where no defects are visible there at the highest powers of the microscope.

The most important refined tests are the tensile and alternating stress tests. The tensile test can be made in any shop provided with the usual tensile testing machine. The alternating stress test is not as yet standardized even for unwelded material.

A great deal may be learned from the appearance of a weld. The appearance in a weld of porosities on top indicates that the metal has been overheated. Inasmuch as it would seem that the serious defects in welds are caused by oxides, it would appear wise in the case of gas welding to use no larger tip than is necessary to produce thorough fusion. This means that the catalogue speeds of welding are impossible if good welds are desired. The same thing is true of electric welds.

It has been found in a number of cases that very great improvements in the quality of the work were made by using regularly the bending test above described, and by carefully instructing the welders until they were able to make welds that would meet this test with unfailing regularity.

COURSE IN BUSINESS MANAGEMENT AND ORGANIZATION

The Extension Division of the University of California announces a correspondence course designed to give the business man an insight into those methods of business management and organization which he may profitably introduce into his own concern. Oscar Eugene Mack, manager export division, George F. Eberhard Company, San Francisco, has prepared the course and conducts it.

SPARKS—Current Facts, Figures and Fancy

(The electric ship, the ostrich egg, the wireless telephone and African electrification are among the features of this page. Here you will also learn of the Cloudster, the tomato-pepper and the latest application of volcanoes to industrial uses.—The Editor.)

The Montana Power Company is planning to install wireless telephones for communication between its eleven power plants which can be used in case of line trouble.

* * *

Volcano power is being contemplated by the people of Hilo who believe that the pent-up gases of the great Kilauea have limitless possibilities for industrial power purposes.

* * *

With eggs at ninety cents a dozen, why not feature the ostrich? This generous creature lays an egg which equals twenty-two of the chicken variety. A two-dollar egg is worth considering.

* * *

There are times when one might use water power direct rather than the result of a plant and transmission lines. In Europe a water-power method has been invented for breaking down rock in masses instead of crumbling it with blasting.

* * *

Since the world's paper supply is ever decreasing and the rice supply is ever increasing it has been decided to make paper from rice straw. A combine of Dutch paper manufacturers is planning a factory in the Dutch East Indies for the manufacture of paper.

* * *

The wonders of the by-product will never cease. Nothing less important than alcohol for motor fuel is being manufactured from the pineapple waste in the Hawaiian Islands. From 350 pounds of waste resulting from the canning process, two gallons of alcohol are obtained.

* * *

The long-looked-for electrically driven passenger vessel has become a reality according to a report that the Cuba, electrically driven, electrically lighted and with electrically driven winches, has successfully passed her dock trials and is ready to sail with her quota of 250 first class cabin passengers.

* * *

"The Cloudster," not the Roadster or the Speedster, is the latest in high class transportation. The Cloudster which is being manufactured in Los Angeles carried a pilot, seven passengers and 1500 pounds of mail and fuel, and has shown that she can go at a speed of 150 miles an hour and to an altitude of 18,000 feet.

* * *

Everyone speaks of the house shortage in more or less agitated tones and at least Fresno is doing her best to overcome it. Her bank clearings for October show an increase of more than $9,000,000 over the preceding month and her building permits for the year promise to exceed the total for last year by more than a million dollars.

* * *

Although food is not generally considered a technical subject, we feel that the production of such as the "tomato-pepper" requires enough science to warrant mention on this page. Luther Burbank announces that by January 1 he will be ready to offer the delectable tomato-pepper as well as the everbearing strawberry for our pleasure.

* * *

The Japanese prefer talking to the dots and dashes system, according to a recent report that the Ministry of the Navy has ordered that the entire fleet be equipped with wireless telephones and that the navy is no longer to depend on wireless telegraphy. Wireless telephony has already been installed in vessels of a unit of the First Squadron.

* * *

Since level stretches and widely scattered communities make Australia the most opportune spot in the world for aerial development, no less than 600,000 pounds sterling appears on the estimates of the Federal Government of that country for aviation. Of this amount 100,000 pounds will be spent on the encouragement of civilian aerial transport.

* * *

A more complete report of the recent test given the freshmen of thirty-eight technical colleges under the auspices of the Society for the Promotion of Engineering Education, shows that California may be credited with both first and second honors. The University of California stood second rather than first, as reported on this page November fifteenth, the California Institute of Technology standing first and Cornell University third.

* * *

Unless one is absolutely up-to-date on the subject of Africa, it seems a bit incongruous to read of plans for railway electrification in that land of elephants and jungles. Nevertheless, it is true that railway authorities intend to proceed at once with the electrification of the Cape Town-Simonstown suburban line as well as the Natal main line from Durban to Pietermaritzburg. Two large coal-burning power stations at Cape Town and Durban will be required in connection with the electrification scheme.

Do you have to stop in the middle of a dance to wind the Victrola?

MAKE IT AN ELECTRICAL CHRISTMAS WITH AN ELECTRIC PHONOGRAPH

PERSONALS

Herbert C. Hoover, president of the American Institute of Mining Engineers, has been elected president of the Federated American Engineering Societies at the recent convention of that body. Mr. Hoover graduated from Leland Stanford Junior University in 1895 and gained considerable reputation as a mining engineer, having in his charge large mining interests all over the world. At the outbreak of the war he was chosen as chairman of the American Relief Commission and had charge of the Commission for the Relief in Belgium. Demonstrating his ability as an executive in these positions, he was appointed United States Food Administrator in 1917 when the United States entered the war. At the last convention of the American Institute of Mining and Metallurgical Engineers he was chosen as president and his recent election to lead the newly formed Federated American Engineering Societies shows the confidence of the engineers in his ability as a leader and executive. The importance to the West of Mr. Hoover's election is apparent when it is remembered that he is a Western engineer understanding the problems of the engineers in the West, and now has the position to use that understanding for the benefit of engineers and for the West.

J. Otis Burdige, formerly with the Emergency Fleet Corporation, has recently become a member of the Valuation Department of the Pacific Gas & Electric Company, San Francisco.

Thomas A. Edison has received the Distinguished Service medal, accompanied by a letter from Secretary of the Navy Daniels, in recognition of the service he has rendered during the past war.

R. A. Schuyler has been appointed manager of the Bozeman, Mont., branch office of the Montana Power Company. Mr. Schuyler was formerly in the operating and engineering department of that company. He has been in their employ since 1912.

O. O. Alenderfer, formerly in charge of commercial sales of the Rogue River division of the California-Oregon Power Company, has resigned and entered into partnership with Mr. A. B. Cunningham, in the firm of the People's Electric Store at Medford.

C. E. Rogers, of the equipment department of the Pacific Telephone & Telegraph Company, San Francisco, has returned from an extended visit to New York and Chicago, where he has been studying problems connected with the installation of fully mechanical telephone switchboards.

A. W. Leonard, Seattle, president of the Puget Sound Power & Light Company, of the Stone & Webster interests, and **D. C. Barnes,** manager of the Seattle division of the same corporation, left Seattle on November 13 on a combined business and pleasure trip to New York and Boston.

V. Dell Butler, formerly first operator in the steam plant station of the Portland Railway, Light & Power Company, Portland, Oregon, has been transferred to the post of superintendent of the Bull Run 15,000-kw. hydro generating plant of that company, located on Bull Run river east of Portland.

R. W. Muller, of the Operation and Maintenance department of the Panama Canal, is back again in San Francisco. For a number of years Mr. Muller was connected with the Pacific Gas & Electric Company at the Electra plant, and also prior to that time at the Drum Power Station.

Robert Sibley, editor of the Journal of Electricity, has been appointed a member of the Executive Committee of the Pacific Coast Section, N. E. L. A., to represent the Technical Press. He is taking the place of W. M. Deming who has gone to Tennessee to attend to business matters of his own.

L. T. Merwin, who was appointed assistant general manager of the Northwestern Electric Company at Portland, Ore., a short time ago, has now been made vice-president and general manager of that company. The story of Mr. Merwin's work in the electrical industry was told along with the announcement made in the October issue of the Journal of Electricity.

R. H. Ballard, S. M. Kennedy and **H. A. Barre,** of the Southern California Edison Company, were guests of the Associated Chambers of Commerce of the San Gabriel Valley at the regular monthly dinner, November 9. They spoke to the meeting on the future of hydroelectric power in California and illustrated their remarks with stereopticon slides of various Edison power properties in the high Sierras.

William Stranahan, civil engineer, who has been in the employ of the San Joaquin Light & Power Corporation since 1909, has severed his connection with that corporation and will become Fresno county representative on the California State Irrigation Association board. This association is interested in the development of the Colonel R. B. Marshall scheme to reclaim 12,000,000 acres of dry land in the Sacramento and San Joaquin valleys and will press for the passage of an appropriation during the next session of the legislature to carry on this work.

R. C. Starr, construction engineer with the San Joaquin Light & Power Corporation, announces his partnership in the new firm, Thebo & Starr, Engineers and Contractors, San Francisco. The San Joaquin Light & Power Corporation has given Mr. Starr the privilege of taking outside work while retaining his position with that company. It will thus be possible for Mr. Starr and Mr. Thebo to keep together the large organization which has been built up by them during their work on important construction projects in various parts of the West within the past ten years.

A. C. McMicken, sales manager of the Portland Railway, Light and Power Company, is taking an active part in the organization of the Northwest Electric Service League, which is passing through the organization stages and beginning to take definite form that will soon render it an active organization. Mr. McMicken began his electrical career in 1902, when he entered the employ of the Portland General Electric Co. After consolidation in 1906, resulting in the formation of the Portland Railway, Light & Power Company, he became power and motor salesman. He held the position of contract agent from 1907 until 1912 when he was made sales manager, which position he now holds. Mr. McMicken has always taken a very active part in Association affairs in the Northwest and is at present a member of the Governing Committee of the Commercial Section of the Northwest Electric Light and Power Association.

J. A. Kahn, general manager of the Capital Electric Company of Salt Lake City, is chairman of the advisory committee of the Rock Mountain Electrical Cooperative League, recently organized. Mr. Kahn has been one of the leaders of the electrical industry in the Intermountain district. Since 1918 he has been connected with the Capital Electric Company, one of the largest firms of its kind in the West. Until recently he has been acting as vice-president and treasurer but has been made general manager. It is felt that Mr. Kahn's long experience in executive capacities and his wide acquaintance in business circles will do a great deal toward making this new cooperative movement a big success.

Edward C. Connolly, of the Conlon Electric Washer Company of Cicero, Ill., is on a visit to San Francisco and other Pacific Coast cities.

V. H. Greisser, chief engineer, Washington Water Power Company, Spokane, Washington, is a recent San Francisco and Los Angeles visitor.

R. D. Likely, formerly electrical engineer with the General Electric Company, Schenectady, N. Y., is now in the electrical engineer's office of the San Joaquin Light & Power Corporation.

C. B. Merrell, who has for a number of years been in the general offices of the Economy Fuse & Manufacturing Company, has been appointed district sales manager of the Philadelphia office.

A. M. Frost, district agent at Selma for the San Joaquin Light & Power Corporation, has resigned to take up the sale of electrical equipment. After September the first he will be succeeded by **J. H. Jarnagin** of the Selma office.

A. C. Holden, sales manager, household appliances division, General Railway Signal Company of Rochester, New York, has been visiting San Francisco, incident to a trip throughout the states in the interests of his company.

O. B. Askren, general sales manager of the King Washing Machine Company of Wolcott, Indiana, is a recent Pacific Coast visitor and has spent some time in both San Francisco and Los Angeles attending to business matters.

F. M. Cooley, sales manager of the Seattle offices of the Western Electric Company, recently spent a week in the northern part of the state of Washington, looking after the affairs of his company. A major portion of the time was taken up in Bellingham.

H. W. Rogers and **W. L. Merrill,** paper mill experts of the Power and Mining Engineering Department of the General Electric Company at Schenectady, are in Portland supervising the starting of the new sectional drive paper machine, at the mill of the Crown Willamette Paper Company at West Linn, Oregon.

E. E. Garlits and **R. B. Berry,** of the merchandising bureau of the Westinghouse Electric & Manufacturing Company, are making a tour of the West in the interest of the merchandising bureau of their company. They arrived in San Francisco last week from Los Angeles and have now left for Seattle.

R. H. Ballard, vice-president, Southern California Edison Company, **J. R. Baurhyte,** chief electrical engineer of the Los Angeles Gas and Electric Company, **E. B. Criddle,** general agent, Southern Sierras Power Company, Riverside, **S. M. Kennedy,** general agent, Southern California Edison Company, **G. D. Smith,** general manager, Ontario Power Company, Ontario, **A. B. West,** president, Southern Sierras Power Company, and **A. E. Wishon,** assistant general manager of the San Joaquin Light & Power Corporation, were in San Francisco last week attending a meeting of the Public Relations Committee of the Pacific Coast Section of the N. E. L. A.

G. E. Armstrong, Pacific Coast editor of the Electrical World, has returned to San Francisco after a four months' visit at the New York offices of the McGraw-Hill Company. Mr. Armstrong returned over the Chicago, Milwaukee & St. Paul Railroad and visited members of the electrical industry in the Northwest.

Edward Whaley, for nineteen years in the employ of the Northern California Power Company, and later in charge of the Northern District of California for the Pacific Gas & Electric Company, has tendered his resignation to accept a position with the Baymiller-Post Company, large land owners throughout the state.

W. S. Berry, Pacific Coast sales manager of the Western Electric Company, San Francisco, has been elected chairman of the recently formed Committee on Power Companies Securities of the San Francisco Electrical Development League. **Robert Sibley,** editor, Journal of Electricity, has been elected secretary. Other members of the committee are: **D. E. Harris,** vice-president, Pacific States Electric Company; **Garnett Young,** general manager, Garnett Young & Company; **R. A. Balzari,** manager industrial division, Westinghouse Electric & Manufacturing Company; **Clyde Chamblin,** general manager, California Electrical Construction Company, and **W. B. Sawyer,** sales engineer, United States Steel Production Company.

Allen G. Jones, special solicitor of the General Electric Company, has been elected secretary of the San Francisco Section of the American Institute of Electrical Engineers. Mr. Jones is a graduate of the Alabama Polytechnic Institute with the class of 1905 and after graduation worked for the Pensacola Electric Railway Terminal Company. In 1908 he joined the General Electric Company at Schenectady, working with Charles P. Steinmetz on high voltage apparatus and lightning arresters. In the next year Mr. Jones came to the San Francisco office of the General Electric Company as specialist on high voltage apparatus and in 1915 was elected secretary of the San Francisco Section of the A. I. E. E. for the first time. Mr. Jones has held this position continuously since that time and the excellent manner in which he has filled this office in the past assures the Section success for the coming term.

OBITUARY

Wm. A. Cattell, formerly active in engineering affairs in and about San Francisco, and secretary of the International Engineering Congress in 1915, died recently at his home in Alhambra, California.

Chester A. Thomas, who has been in charge of the Guggenheim mining interests in Arizona and California for many years, died recently in Dawson. Before last August he was manager of the Selby Smelter in San Francisco.

Does your husband swear when the baby cries at night?

MAKE IT AN ELECTRICAL CHRISTMAS WITH AN ELECTRIC MILK WARMER

HAPPENINGS IN THE INDUSTRY

POWER PROJECT PROPOSED IN OREGON

The development of 11,700 horsepower is contemplated in an application filed with the state engineer by the Clackamas Power & Irrigation Company, a subsidiary company of the Portland Railway Light & Power Company of Portland. The application contemplates the erection of a hydroelectric plant on the Clackamas river east of Oregon City and the appropriation of 1000 second-feet of water from the river. A flume 6.6 miles long will also be constructed, the estimated cost of the entire project being $1,250,000.

Application for the appropriation of water and filing of plans for the plant are preliminary and immediate development is not contemplated.

SURVEY OF COLUMBIA BASIN PROMISED

A board of review has been named to examine the report of the State Columbia Basin Survey Commission on behalf of the Department of the Interior. It is expected that action will soon be taken by the Department. Two members of the board, as named by Arthur P. Davis, director of the United States Reclamation Survey, are D. C. Henny of Portland and James Munn, Denver, both consulting engineers of the survey.

SECURITY BOOKLETS

These readable looking pamphlets which deal with the financial problems of the electric light and power industry have been prepared by the publicity department and the executive committee of the Public Relations national section of the N. E. L. A. in cooperation with the Public Service Securities Committee of the Investment Bankers' Association of America. It is planned to have these forwarded by members to their security holders or prospective purchasers of securities. The Investment Bankers plan to circulate 200,000 to their own clients.

NEW POWER COMPANY IN ARIZONA

A new western power company was created November 15 when the Central Arizona Light and Power Company of Phoenix, Arizona, took over the property of the Pacific Gas & Electric Company of that city and commenced operations with a birthright of eight thousand consumers.

The new company plans to grow even faster than its predecessor, which itself has grown during the past few years even more than the city of Phoenix itself, because of the great demand for power for manufacturing and irrigation purposes. During the past year over one hundred thousand dollars have been spent to construct transmission lines and substations to serve the Avondale district with irrigation power. As a result of this development over seven thousand acres have been turned from desert to prosperous farm lands.

The management estimates that $1,500,000 will be spent for improvements during the next three years.

BANKERS TO CO-OPERATE WITH PUBLIC UTILITIES

The board of governors of the Investment Bankers Association of America has passed a resolution of especial significance to all public utilities in this country. It states that whereas expanding public utilities are essential to the welfare of communities and the cost of operation has been considerably increased and there is a recognized shortage of power,

"Therefore Be It Resolved, That it is the sense of the Board of Governors of the Investment Bankers' Association of America that there should be cooperation between the investment bankers, and the owners and operators of public utilities, and the regulating officials, in laying before the public full information respecting the vital importance of prompt and continuing expansion of all kinds of utility service, and in encouraging such utility regulation as will provide sound credit as the basis for financing, to the end that the investing public may provide the necessary funds by investment in sound public utility securities."

PASADENA STARTS LIGHTING PLANT ADDITIONS

The first unit of a $300,000 addition to the municipal lighting plant of Pasadena will be installed next summer, according to C. W. Koiner, general manager of the plant. The light department has just purchased several lots from the Pacific Electric Company and a new building is to be erected to house the enlarged plant.

One boiler is to be installed during the coming summer at a cost of $50,000, while a turbine and two other boilers will be put in the following summer.

GREAT WESTERN POWER COMPANY HEARING

That the Great Western Power Corporation expects to spend $200,000,000 upon its California hydroelectric development program within the next fifteen years, and that the Railroad Commission will not accept the present high prices in arriving at a rate base, were the features of the initial hearing of the Great Western Power Corporation's recent application for increased rates. The hearing was continued until January 19, 1921.

P. G. & E. RATE HEARING IS POSTPONED UNTIL JANUARY 17

The hearing in the case of the Pacific Gas & Electric Company for readjustment of electric power rates will begin January 17, 1921, in the commissioner's room in the Flood Building, according to an agreement reached between consumers, attorneys and individuals, and corporations and the State Railroad Commission. The continuance was granted by Commissioner Frank R. Devlin to allow the engineers interested in the case to study valuations of the properties involved.

SURVEY OF WASATCH RANGE COMPLETED

The topographic survey, which was begun last July, covering the entire western slope of the Wasatch mountain range, has been completed.

The work of assembling the maps and making plats will be done at the headquarters of the U. S. Geological Survey at San Francisco and as soon as possible copies of the maps will be issued by the Government in the form of a bulletin which will be furnished to all applicants.

The data gained will also be used by Ralf R. Woolley, hydraulic engineer of the U. S. Geological Survey, at Salt Lake City, in compiling his book on "Water Power Possibilities of the Great Salt Lake Basin."

INITIAL STEP IN POSSIBLE 10,000 HORSEPOWER DEVELOPMENT

The Peninsula Light and Power Company, a newly organized company of which James Murray is vice-president and treasurer, is developing a project on the Skykomish river four and a half miles west of Potlatch, near Lake Cushman. The initial development will be 10,000 hp. and the claim is made that a development of 350,000 hp. is possible at this point. The company has entered into a contract with the Northwest Electric & Water Works Company to supply them with electric energy June 1, and negotiations are under way with the lighting companies of Hoquiam and Aberdeen to supply them with power.

ELECTRICALLY OPERATED OLIVE PLANT

The opening of this new electrically operated olive plant of the Ehmann Olive Company was a feature of the fifth Orange and Olive Exposition held in Oroville, California, during the latter part of November. It is estimated that this electrically operated plant with a load of 100 hp. will turn out 12,000 cans of olives and 60,000 gallons of olive oil this season.

REHEARINGS OF CONTRACT CASE DENIED

The public utilities commission of Utah has denied the petitions of thirty-three of the larger customers of the Utah Power & Light Company for rehearings in the "special contract" case which was recently decided by the commission and reported in the November 15th issue of the Journal of Electricity. This denial leaves the way open in regular procedure for appeal to the supreme court of the state, or, in course of time, to the Supreme Court of the United States.

In this decision the commission granted the Progress Company, the Salt Lake Pressed Brick Company, and several other customers, permission to re-open their cases and make additional showing to the effect that certain water rights transferred to the power company had an actual value justifying the low rates given in the special contracts. The two customers above named have re-opened their cases. In these instances water rights for power purposes in Mill Creek and the Cottonwood canyons are involved.

THE SAFETY FIRST LESSON

Every announcement in the morning newspapers of a death through electrocution is a setback to the public confidence in all use of electricity, as well, of course, as an irreparable personal and economic loss and nothing should be left undone to impress the dangers of carelessness upon employes. The lesson of safety first is well told by this remarkable snapshot of an accident which occurred in Portland, Oregon. The lineman who suffered the fatal accident had disregarded instructions in not using shields and rubber gloves, with this result. The gloves may be seen on the top cross arm to the right of the pole.

Carelessness proves fatal

PIT RIVER DEVELOPMENT STARTED

The initial step in the development of some 80,000 horsepower along the Pit River was taken on November 6 when the Pit River Power Company awarded Palmer & Peterson, of San Francisco, the contract for constructing the 200-ft. dam at Sheep Rocks.

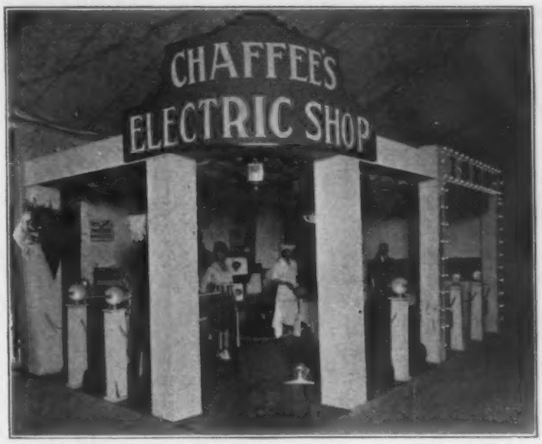
The entire project contemplates the development of potential water power along the Pit River, Shasta county, California, from Mile 12 above the junction of the Sacramento River to Mile 34. Within this distance there is a fall of approximately 400 feet, and it is proposed to utilize this by constructing two dams approximately 200 feet high across the river canyon. The normal minimum stream flow is 2,700 second-feet. Sheep Rocks, the site of the first plant, is about two miles above the junction of the Pit with Squaw Creek; fifteen miles northeast of Redding. A railroad two miles in length will be built from the Sacramento Valley & Eastern Railroad to the damsite. This initial plant will be for 48,000 kw., or approximately one-half the total. Vertical wheels of the Francis type are to be used, operating under an effective head of 190 ft. Generators will each be 16,000-kw., 3-phase, 60-cycle, and the voltage will be stepped up in outdoor type transformer stations to a transmission voltage to be determined later.

ELECTRICAL EXHIBIT AT TULARE COUNTY FAIR

One of the notable features of the Tulare county fair held at Visalia, October 9th to 16th, was the combination electrical exhibit of the Chaffee Electric Shop, Visalia, and the E. M. M. Service, Lindsay and Exeter. These two companies occupied a double space corner location booth.

The Chaffee Electric Shop devoted space to the exhibition of electric appliances, washing and ironing machines and electric ranges. The E. M. M. Service featured the ISKO electric refrigerator.

Each visitor was required to sign a ticket which entitled him to take part in a prize drawing for a Westinghouse Cozy Glow heater. Over seventy-five thousand visitors registered and took part in this drawing.



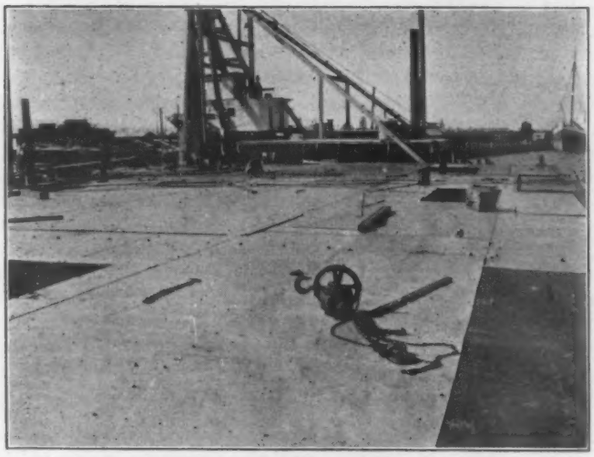
During the Tulare county fair electric range demonstrations were conducted here daily by Mrs. Eugenia Galvin of the Westinghouse Electric & Manufacturing Company, and ironing machines were demonstrated by Mrs. E. Scott. Mr. Harry Nutt, E. M. M. Service, was in attendance daily, demonstrating the ISKO electric refrigerator.

Does the spectre of the high cost of gasoline haunt your dreams?

MAKE IT AN ELECTRICAL CHRISTMAS WITH AN ELECTRIC AUTOMOBILE

CLAM SHELL DREDGE IS BEING ELECTRICALLY WELDED

Electric welding is being used extensively in the construction of a large steel clam shell dredger now being built at the shipyard of B. P. Lanteri at Pittsburg, California, for



One man is able to weld forty feet of this steel deck every day with a regular electric welding outfit

the Monarch Dredging Company. This vessel will be used in reclamation work in the lower delta regions of the Sacramento and San Joaquin rivers.

The principal welding is being done on the steel deck. These ¼-inch plates are being lap welded with a 200-ampere, 60-volt G. E. welding outfit. The generator is being driven with a belt-connected 10-hp. motor. One man is doing the welding and is able to cover about 40 feet a day.

In addition to welding for the deck the machine is being used for such other work as sealing up joints instead of caulking, going around edges of outboard fittings to make them watertight, as well as assist in securing the same, attaching hangers and brackets for pipes, fittings and machinery, in the construction of tanks and various other kinds of work.

After the dredge is completed the electric welding set will be part of the equipment of a well appointed machine shop aboard the dredge for use in repair work.

SAN FRANCISCO LIGHTING EXHIBIT OPENS

The Industrial and Commercial Lighting Exhibit of the California Electrical Cooperative Campaign in the Safety Museum of the State Industrial Accident Commission in San Francisco was opened on the evening of November 22. Members of the State Industrial Accident Commission and of the San Francisco Electrical League were the especially invited guests at the opening demonstration.

Mr. D. E. Harris of the Advisory Committee of the Cooperative Campaign acted as chairman of the evening, and in his remarks regarding the object of the exhibit laid emphasis upon the fact that this is not an exhibit of materials or lighting units, but an exhibit to demonstrate and visualize the benefits of correct and efficient industrial and commercial lighting as contrasted with incorrect and inefficient lighting installations. He urged that the electrical men present remember that the primary purpose of this exhibit is to sell the service of better industrial and commercial lighting to the public and that the Advisory Committee would not tolerate any subversion of this primary object to the commercializing of the exhibit by any manufacturer or his representative whose material or lighting units are installed in the exhibit. He stated that if the exhibit should be commercialized by the people handling any of this material the Advisory Committee would promptly remove their material from the exhibit.

W. J. French, chairman of the State Industrial Accident Commission, was introduced and on behalf of the Commission welcomed the men of the electrical industry and invited their cooperation with the Commission in the solution of the various problems affecting safety in industrial plants.

L. E. Voyer, president of the San Francisco Chapter of the Illuminating Engineering Society, was then introduced to present the subject of better industrial and commercial lighting. The subject was presented with the aid of actual demonstrations of the effect of various systems of lighting which are made possible with the installations provided for this exhibit. Five separate types of lighting installations are installed and by means of a central switchboard and an arrangement of cords and pulleys the various installations can be operated separately or simultaneously and the effect of height and spacing of units observed.

On November 27th this lecture and demonstration was repeated under the direction of Clark Baker for the benefit of the electrical contractors and dealers. Robert Prussia will direct the December 3rd demonstration which will be held for the benefit of the central station men, jobbers' salesmen, architects and engineers of the region surrounding San Francisco. An effort is being made to have men as far south as San Jose present at this time.

The California Electrical Cooperative Campaign is now installing a similar exhibit in the rooms of the Chamber of Commerce, Los Angeles. The month of January, 1921, will be devoted by the Campaign to the subject of industrial and commercial lighting and every member of the industry should be prepared to help sell this idea to the public.

NEWSPAPERS TELL THE STORY

The Southern California Edison Company recently took the newspaper men of southern California over its system, telling them the same story of future development which was presented in the May 15th issue of the Journal of Electricity. Some of the valuable results are shown above. Without a doubt the story has been told to the public. From left to right the above clippings appeared in the Courier of Oxnard; Facts of Redlands; Delta of Visalia, and the Hanford Sentinel, Hanford.

CALIFORNIA RAILROAD COMMISSION ISSUES ANNUAL REPORT TO GOVERNOR

Declaring that California is at the gateway of enormous possibilities but that it will not reach the peak of development unless its wonderful natural resources are carefully fostered and utilized, the California State Railroad Commission, in a letter to Gov. William D. Stephens transmitting its annual report, urges a survey of the state's water and power resources. Full use of water and cheap power are the state's need, says the Commission.

"California's streams and rivers, its rainfall and its snowfall must be made to serve and to serve well. It is the Commission's firm belief that financially sound utilities, functioning economically and efficiently will successfully carry the burden of California's development. It is obvious that industrial California, agricultural California cannot reach the peak of development unless there stride, a step in advance, utilities carrying service possibilities 'ready on demand.' Such a service has been, is and will be the aim of this Commission. It can be accomplished only through the fair distribution of the costs and fair treatment of utility consumer, utility owner and utility labor."

Continuing, the report covers water conditions, utility costs, fuel costs, the Federal Transportation Act, electric railway conditions and auto transportation.

ELECTRICAL UTILITIES AND THE LEVER ACT

In view of the widespread publicity given the indictment of the Brooklyn Edison Company, Inc., for alleged violation of the Lever Act, executives of electric light and power companies will be interested in the decision of Judge Julius M. Mayer of the U. S. District Court of New York, to the effect that hoarding coal by public utilities corporations is not punishable under the provisions of the Lever Act because "the defendant is not a wholesaler, retailer or other dealer in coal, nor is it a manufacturer within the meaning of Section 6. * * * The defendant is a public utilities corporation engaged in the business of the manufacture, production and sale of electric light and power. * * * They owe a duty to the community to furnish light and power adequately and without cessation so far as practicable. * * * It was the duty of the light and power public utility corporation, so far as possible, to safeguard against the shutting down or suspension of service of light and power."

SALES CAMPAIGNS SUCCESSFUL

Jobbers and dealers in the Puget Sound district, especially those in the smaller towns and rural communities, are conducting sales campaigns on electrical appliances with fair results. Reports from several different sections in this district state washing machines, vacuum cleaners and socket device heaters are moving very satisfactorily. Ironing machines, also, while comparatively new in this territory, are showing a good movement considering their price.

In most cases, the campaigns consist of window demonstrations, house to house solicitations and newspaper advertising.

HYDRO-ELECTRIC PLANT TO BE CONSTRUCTED IN ARIZONA

One of the largest hydroelectric and irrigation projects in the Southwest is soon to be undertaken near Planet, Ariz., by the Stone Consolidated Copper Company, as shown by surveys which it has just filed with the state authorities. It is planned to construct a dam across the Big Williams fork of the Colorado river at a point near Planet and to impound a sufficient supply of water to irrigate 276,000 acres of desert land. The storage supply of water will be used for generating electric power for operating the mines and industries of a big scope of territory.

CALIFORNIA PUBLIC UTILITIES TOTAL 798

There are 798 public utilities in California filing annual statements with the Railroad Commission, says the annual report of the Commission for the year ending June 30, 1920, just made to the Governor. Of these 19 filed their first report at the close of 1919, and in the same period 40 filed their last report. The reports filed with the Commission cover the finances of the utilities. They are made in accordance with a form prescribed by the Commission, which also prescribes the accounting methods of the utilities. The following shows the number and class of utilities operating in this state:

Steam railroads—operative	50
Steam railroads—lessor	9
Steam railroads—under construction	3
Electric railways—operative	30
Electric railways—lessor	4
Electric railways—under construction	...
Express companies	2
Water carriers	25
Electric companies	70
Gas companies	21
Gas and electric companies	13
Telephone companies	106
Telegraph companies	3
Telephone and Telegraph companies	7
Warehouse	142
Water companies	299
Wharfingers	14
Total	798

RIGHT TO PROHIBIT WATER APPLICATION QUESTIONED

Constitutionality of the Utah state law, giving the state engineer power to withdraw from entry, with the consent of the governor, the waters of any particular river or other source of supply, is to be tested out in a suit brought by Caleb Tanner against the present state engineer, George F. McGonagle.

Mr. Tanner has filed application with the state engineer for permission to divert 33.47 second-feet of water from the Provo river, with which to develop about 250 horsepower of electrical energy, and to return the water to the West Union canal. Mr. McGonagle refused to accept the application, apparently on the ground that the waters of the Provo river have been withdrawn from entry for the present. This action was taken on the organization of the Utah Water Storage Association, an organization of eight counties watered by the Provo and Weber rivers and by waters from Utah lake. The association requested the withdrawal of the two rivers and of Utah lake waters during the period of investigation of possibilities of development, and the state engineer acted under a law passed two years before.

LARGEST RADIO STATION ON COAST PROPOSED FOR SEATTLE

A proposal to give Seattle the most powerful radio telegraph station on the Pacific Coast, providing shippers with a service which will enable them to reach vessels as far out as 2,500 miles at sea, was placed before the Finance Committee of the City Council by the Independent Wireless Company of America recently.

MILWAUKEE ROAD SHOWS VALUE OF ELECTRIFICATION

Electrification on the Milwaukee-Chicago & St. Paul Railroad has fulfilled all expectations and the continued tests and comparisons with the steam locomotives are all in favor of the electric motive power, according to H. B. Earling, vice president of the Milwaukee railroad.

"To relieve freight congestion we have managed to increase freight mileage per hour and to get larger loads on cars. We have expected a greater demand for cars than the supply, but at the present time the car shortage has practically ceased."

ELECTRICITY TO BE USED IN LARGE DREDGING PROJECT

Electrically operated dredges are to be used entirely by the largest dredging project ever scheduled on the Pacific Coast, which will be done as a part of the $3,000,000 dredging, reclamation and construction work scheduled by the naval public works department in the San Diego harbor.

The contract for about 3,300,000 cubic yds. has been let to the United Dredging Company of Los Angeles. For a time the company is planning to operate one electric dredge with from 100 to 1200 hp. taken from the shore. As soon as the work now being done for the War Department is finished, the dredge being used there will be moved to the Navy project. This dredge, which is the most powerful on the Pacific Coast, has a capacity of from 1200 to 1400 hp. and having a steam turbine can either generate its own current or take it from the shore.

Do you burn your fingers with a match when you drop your change in the dark?

MAKE IT AN ELECTRICAL CHRISTMAS WITH AN ELECTRIC FLASHLIGHT

INCREASED YIELD FROM PUBLIC UTILITY SECURITIES

A recent statement issued by the National City Company, New York City, shows that utility securities yield two and three per cent more now than before the war. It reads as follows:

"Discriminating investors are now analyzing the public utility situation. New capital is required in every branch of the public utility field, and this company seeks to bring to the attention of investors securities which have been purchased after careful investigation and which, in our judgment, justify high confidence. Before the war public utility securities issued by corporations of undoubted strength and based on strong values and earning power were sold on a basis to yield around 5 to 5½ per cent. Now, with largely increased values and increased demand for the output, the same class of securities can be bought on a basis to yield from 7 to 8 per cent."

GROSS EARNINGS OF P. G. & E. SHOW $6,414,535 GAIN IN NINE MONTHS

The Pacific Gas & Electric Company has made a public statement to the effect that its gross earnings for the first nine months of 1920 showed an increase of $6,414,535 over the corresponding period of 1919.

According to the company this remarkable increase in earning capacity was due partly to the acquisition of new territory and in part to a more intensive cultivation of the field already covered by the company's operations.

The balance remaining for preferred stock dividends, after providing for operating expenses, fixed charges and every forseeable contingency, was $3,083,138.87. The three quarterly preferred stock dividends so far paid this year aggregate $1,317,797.38, leaving a margin of safety over these dividends of $1,765,341.49.

In other words, the company earned its preferred stock dividends in this period 2.34 times.

Approximate condensed income account statement for the nine months ended September 30, 1920, together with comparisons, follow:

	1920	1919
Gross earnings, incl. miscellaneous income	$25,879,471.61	$19,464,936.58
Maintenance and reserve for depreciation	3,112,370.60	2,293,800.11
Operating expenses, rentals, taxes (including Federal taxes) and reserves for casualties and uncollectible accounts	15,072,938.34	10,433,441.25
Total expenses	$18,185,308.94	$12,727,241.36
Net income	7,694,162.67	6,737,695.22
Bond and other interest	3,644,680.20	3,154,313.57
Balance	$ 4,049,482.47	$ 3,583,381.65
Bond discount and expenses	216,343.60	155,942.04
Balance	$ 3,833,138.87	$ 3,428,439.61
Additional depreciation reserve	750,000.00	750,000.00
Surplus	$ 3,083,138.87	$ 2,677,439.61
Dividends on preferred stock	1,317,797.38	1,127,089.28
Balance	$ 1,765,341.49	$ 1,550,350.33

NEW LAW WILL AID ROAD BOND SALES

At the November 2nd election California voters approved a measure whereby there is provided a flexible rate on highway bonds and means for adjusting that rate from time to time to suit market conditions. This measure is expected to very materially expedite financing state highway work, to more equitably distribute its cost, and to relieve the highway commission of the necessity for requiring counties to contribute the difference between the par and market values of bonds used for road work within their boundaries.

It will probably be February first before all arrangements are made so that contracts can be let safely.

CITY AND UTILITIES TO COOPERATE UNDER NEW LAW

Amendment thirty to the San Francisco charter passed November 2nd, provides a simple method whereby city officials can agree with utility officials on price and terms and then submit to popular vote for ratification any proposal for purchase of a utility. Only a majority vote is required to carry.

TRADE NOTES

Electric Appliance Factory in Chicago —

A one-story factory to be used for the manufacture of an electric appliance known as the Mercer Ironing Machine is to be constructed by the Western Appliance Manufacturing Company of Chicago. C. N. Briggs is president of the company, and P. H. Vanasse, vice-president; B. N. Mercer is secretary. The plant is to have a capacity of five hundred machines within ninety days, it is stated by company officials. The structure will be 110 ft. by 90 ft. in size and will cost $25,000, exclusive of equipment.

90% of Employes Take Voluntary Insurance —

Over 90 per cent of the employes of the Westinghouse Electric & Manufacturing Company, at the East Pittsburgh Works, have taken advantage of the additional insurance feature of the Insurance and Savings Plan recently made effective by the company.

New Electric Shop in Alhambra —

R. E. Heerman, organizer of the S. & H. Service Electric Co., Inc., El Monte, California, is now in Alhambra, California, giving personal attention to their store No. 2 which was opened a short time ago in that city.

New Portland Store —

The former J. R. Davidson Electric Co. of Portland has been changed to the Davidson-Atwood Electric Co., and is now located at 390 Morrison Street. L. E. Atwood, formerly with the Stubbs Electric Co. and the North Coast Electric Co., both of Portland, has bought a half interest in the firm.

Intermountain Representative —

The Roller-Smith Company, New York, announces the appointment of Mr. L. Brandenburger, 59 West Broadway, Salt Lake City, as its representative in Utah and parts of Idaho, Wyoming and Montana. Mr. Brandenburger will handle the Roller-Smith Company's entire list of instruments, meters and circuit breakers in that territory. In addition he represents the Wagner Electric Manufacturing Company, the Cutler-Hammer Manufacturing Company, the Delta Star Electric Company, the American Insulated Wire & Cable Company and the Esterline Company.

Salt Lake Company Opens New Home —

The Capital Electric Company of Salt Lake City has recently opened the doors of its new home, which has four spacious floors and large basement, affording 42,000 square feet of space, to be used for warehouse, showroom and office purposes.

E. M. Ellis, a General Electric Company warehouse specialist, spent several months supervising the work of architests and builders. Among the distinctive features of the building are an unusually attractive display room, an automatic passenger elevator, a large spiral gravity chute, a machine shop and factory, and the most modern provision for the comfort of employes.

Wagner's Service Station in Portland —

The Wagner Electric Company will open up a service station at 327 Flanders street, Portland, Ore., for service on motors and other equipment sold by them. The company has also announced the removal of its Salt Lake City office to 59 West Broadway and the opening of a service station as well at this address. L. Brandenburger will continue in charge as branch manager.

New Seattle Store —

The Riley-Conley Company recently opened an electrical retail store in Seattle, handling a complete line of electrical appliances for the home. This company is western Washington distributor of Western Electric power and lighting outfits, appliances and apparatus.

Meeting Notices for Electrical Men

(The newly organized Rocky Mountain Cooperative League, the Jobbers' camping trip, the 1921 plans which the Advisory Committee has made for the California Cooperative Campaign, and numerous A. I. E. E. activities in all parts of the West are among the meeting notices presented on the following pages. The recent Advertising meeting of the San Francisco Electrical Development League is also presented as well as a report of the new members of the Federated American Engineering Societies.—The Editor.)

Plans for 1921 Made at Advisory Committee Meeting

The Advisory Committee of the California Electrical Cooperative Campaign held its monthly meeting in Los Angeles on the 15th and 16th of November, at which time the plans on the work of the Cooperative Campaign during 1921 were discussed and the necessary action taken to put them into operation. One important feature of these plans is the decision to devote each month of the coming year to a particular problem of the electrical industry in California by concentrating the work of the organization each month upon one particular subject.

At luncheon on the first day of the meeting a considerable number of representatives of the different branches of the industry were guests of the Advisory Committee and a discussion of different phases of the Cooperative Campaign's work took place. Mr. E. E. Garlits brought a message of congratulation and a promise of cooperation from the Pittsburgh offices of the Westinghouse Company and said that the entire electrical industry in the East is much interested in the work of the Campaign. Mr. R. H. Ballard, of the Southern California Edison Company, said that one of the most valuable achievements of the Cooperative Campaign is the development of a spirit of confidence among the different branches of the electrical industry in California which will make possible even greater accomplishments by the Cooperative Campaign during the coming years.

The Advisory Committee visited the Modern Electrical Home now open in Los Angeles, and was delighted to note the interest shown by the public, and the effective cooperation of the electrical industry in preparing the exhibit. The Advisory Committee will continue the work of establishing electrical homes throughout the state during 1921 and expects to achieve large results in better and more adequate wiring of homes, to the mutual benefit of the public and the electrical industry.

L. B. Fuller and J. B. Ambler were appointed on the committee for drawing up a law for licensing engineers. The chairman announced that an extension to the section's territory had been granted.

Northwest Development at Joint Oregon Meeting

The development of the Northwest was the subject of an address given by G. E. Armstrong, Pacific Coast Editor of Electrical World, at the November 23rd meeting of the Portland Sections A. I. E. E., the N. E. L. A. and the Association of Electrical Contractors and Dealers.

BUILDERS OF THE WEST — XC

ROBERT M. KEENEY

The discovery of gold and other precious metals was one of the original causes of the settlement of the West, and while an industrial and agricultural center has been built up by the sons of those gold-seeking pioneers, the production of metals still makes a great contribution to the wealth of the West. The mineral resources and abundant water power west of the Rockies should make this section an important center for the electric furnace industry and the fresh source of wealth it is developing in the production of the ferrous alloys of tungsten, vanadium and manganese. To Robert M. Keeney, director of the Department of Metallurgical Research of the Colorado School of Mines, this issue of the Journal of Electricity is affectionately dedicated in appreciation of the important work which he has done in making possible the extended use of the electric furnace in this field.

Early Electrical Experiences and Inductive Interference Topics at Utah A. I. E. E. Meeting

At the November 10th meeting of the Utah section of the American Institute of Electrical Engineers E. G. Holding presented an interesting paper under the title, "Early Electrical Experiences in Utah," which called forth the suggestion that an early history of the electrical industry in Utah be obtained and made part of the Institute records while a few pioneers are left. A very instructive paper under the title of "Inductive Interference Problems" was presented by P. A. Jeanne.

Industries Association Holds "Furniture Day" Meeting

The importance of building up western industries was emphasized at the November 18th meeting of the California Industries' Association, which was given the name of "Furniture Day." The most significant fact brought out in the talks of leaders of the furniture industry was that the campaign to educate Californians to the value of purchasing California goods has borne fruit, and one instance is the fact that in ten years the amount of California-made furniture purchased from California stores has increased from practically nothing to fifteen per cent of the total sales.

Mining Men Entertained by Denver A. I. E. E.

The members of the Mining Congress which convened in Denver during the week November 15-20 were guests of the Denver Section A. I. E. E. at the November 20th meeting. Mr. H. F. Lunt, Commissioner of Mines for the state of Colorado, addressed the meeting on Electricity in Mining from a Standpoint of Safety.

Rocky Mountain Cooperative League Is Organized

For the purpose of conducting an educational campaign to encourage cooperation between the several branches of the electrical industry, to further the practice of good ethical business methods and to give the consumer better value for the money he spends for electrical service, the Rocky Moun-

Does the small boy of the house borrow the wire clothes line for antennae?

MAKE IT AN ELECTRICAL CHRISTMAS WITH A RADIO SET

tain Electrical Cooperative League has been organized at Salt Lake City, Utah.

The activities of the League will extend to the states of Utah and Idaho; also that portion of Wyoming and Nevada served by Salt Lake City as a distributing center for electrical goods.

An advisory committee, which will be the governing body, has been appointed, consisting of representatives of

B. E. Rowley, to the left, is vice-president of this new cooperative league. He holds the position of sales manager with the Edison Electric Appliance Company. R. M. Bleak, secretary and treasurer of the advisory committee, is superintendent of lighting and appliance sales for the Utah Power & Light Company.

the manufacturer, the jobber, the contractor-dealer and the central station, the four branches of the electrical industry. This committee is composed of the following men:

J. A. Kahn, vice-president and general manager, Capital Electric Co., chairman.
S. R. Inch, vice-president and general manager, Utah Power & Light Co.
P. M. Parry, commercial manager, Utah Power & Light Co.
R. M. Bleak, superintendent lighting and appliances sales, Utah Power & Light Co., secretary and treasurer.
H. M. Ferguson, manager Salt Lake Division, Utah Power & Light Co.
B. E. Rowley, sales manager, Edison Electric Appliance Co., vice-chairman.
C. H. Talmage, manager, Western Electric Co.
C. C. Campbell, sales manager, Intermountain Electric Co.
E. H. Eardley, manager Eardley Electric Co.
J. D. Nicholson, manager electric department, Mine & Smelter Supply Co.
Geo. R. Randall, manager, Salt Lake Electric Supply Co.
James S. Walker, manager, Walker Electric Supply Co.
G. W. Forsberg, manager, Wasatch Electric Co.
Stanley Stevens, manager, Stevens Sales Co.
Robert Miller, sales department, General Electric Co.
W. A. Moser, manager, Westinghouse Electric & Manufacturing Co.

The campaign will be conducted along somewhat similar lines to that of the California Cooperative Campaign.

San Francisco Section A. I. E. E. Hold First Meeting of Season

The San Francisco chapter of the American Institute of Electrical Engineers held the first meeting of the present season at the Engineers' Club in San Francisco on the evening of October 29. J. P. Jollyman, engineer of the Pacific Gas & Electric Company, newly elected chairman of the section, presided and introduced Miss Clotilde Grunsky, associate editor of the Journal of Electricity, as the first lady member of the Institute west of the Rocky Mountains.

R. C. Starr, construction engineer of the San Joaquin Light and Power Corporation, was the first speaker of the evening, and he told of the construction of the Kerckhoff project which set a record in speed. The talk was accompanied by a number of slides showing the project in various stages of construction and some of the methods used which made possible the great saving of time in the completion of the project.

L. J. Moore, electrical engineer of the San Joaquin Light and Power Corporation, then told of the construction of a 110,000-volt wood pole transmission line which was built by the company, and dwelt on the economic factors which governed the choice of this type of construction. One of the chief factors which led to the choice of this type of pole line was the fact that most of the line ran through highly cultivated country and the cost of rights of way for steel towers would have been prohibitive. Therefore it was decided to run the line on wood poles along the highways and Mr. Moore's paper discussed the technical problems that had to be met in the designing of this line.

COMING CONVENTIONS

A. S. M. E. ANNUAL MEETING
New York City, Dec. 7-10, 1920
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
Annual Convention—Salt Lake City, Utah
June 20-26, 1921

New Officers, Oregon Chapter A. I. E. E.

O. Laurgaard, city engineer of the city of Portland, was elected president of the Oregon chapter of the American Association of Engineers, at a recent meeting of the association. Other officers elected were three vice-presidents, a secretary and a treasurer. Lewis A. McArthur, secretary of the Oregon Geographic Board, spoke on "Topographic Surveys in Oregon." Percy Cupper, state engineer, said that without good topographic maps splendid reclamation possibilities might have been overlooked for many years.

The objects, purposes and aims of the association are stated as follows:

To distribute fullest information obtainable at all times regarding matter of excellent class of electric contracting and construction; to issue engineer data sheet regarding electrical engineering and contracting problems of more complex nature; to collect and distribute data pertaining to cost of operating and maintaining of an electrical contractor and retail establishment; to aid in bringing friendly relations between electrical contractors and dealers and others engaged in electrical industry; to assist in marketing only high grade materials and apparatus of American manufacturing; to encourage members in conducting attractive e'ectrical stores and promoting the welfare and interest of the employes. To elevate the standard of electrical installations and discourage the tolerance of electrical work by amateurs; to cooperate with the state board of fire underwriters and the state and municipal inspection department, municipal electric light and power company; to cooperate with and assist architects and engineers in successfully combating their various problems; to cooperate with local credit associations toward general improvement of local business conditions.

Legal Aspect of Merchandising Presented to Development League

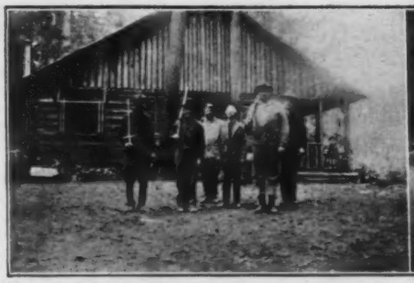
"The Legal Aspect of Merchandising" was the subject of the talk presented to the San Francisco Electrical Development League at their regular meeting in the Palace Hotel on November 15. President Bill Shreve was back after his trip through the East and was accorded a hearty welcome by the members of the League. The committee on helping the public utilities to cooperate with J. E. Harris and W. E. Berry of the Jobbers' Association was announced as follows:

R. A. Balzari, manager industrial division, Westinghouse Electric & Manufacturing Company; C. H. Chamblin, manager, California Electrical Construction Company; Garnett Young, general manager, Garnett Young & Co.; W. B. Sawyer, Jr., sales engineer, U. S. Steel Products Co.; and Robert Sibley, editor, Journal of Electricity.

Mr. Albert Elliot, San Francisco attorney, the speaker of the day, made the distinction between intra-state and inter-state trading and stated that the Sherman Act, the Clayton Act and the Federal Trade Commission's decisions did not apply in the case of intra-state dealings. He also stated that the question of what determines intra-state operations had never been clearly settled.

This is the engineering committee of the Pacific Coast Section N. E. L. A. which so thoroughly discussed high voltage transmission and inductive interference at its recent Los Angeles meeting, as reported in the November 15th issue of the Journal of Electricity.

Camping on the McKenzie



SHOOTING THE JUDGE

This squad of braves were delegated to shoot the Judge Advocate, C. E. Wiggin, who seems to have issued a decree displeasing to the body at large.

THE CABIN

This log cabin located at the head of the McKenzie river, about sixty miles from Eugene, Oregon, was made the headquarters of the camping trip pictured on this page.

THE HOSTS

O. B. Strbbs and F. N. Averill, shown stumping it above, were the hosts at the Stubbs cabin. "Not a dull moment" was their motto, and according to reports they were successful.

Now that the good old summer time is at the opposite side of the calendar it is well to look back upon the summer frolics of the electrical industry. Famous among those which took place last August is the camping trip taken by a number of prominent jobbers of California and Oregon way up at the head of the McKenzie river. Judging from the after-smiles these two weeks accomplished the work of a whole line of cooperative campaigns.

DINNER

The entire party of campers can be seen here assembled around the board. At the extreme left one sees the arm and knee of C. R. Bach, Manhattan Electric Supply Co., S. F. Next is W. M. Deming, at that time with the McGraw-Hill Publishing Co., now in Tennessee. At Bill's left is C. M. Will, Fobes Supply Co., Portland. Then sits C. E. Wiggin, of Dunham, Carrigan & Hayden, S. F., then C. C. Hillis, Electric Appliance Co., S. F.; F. N. Averill, Fobes Supply Co., Portland; O. B. Stubbs, Stubbs Electric Co., Portland; H. E. Sanderson, Bryant Electric Co., S. F.; H. B. Squires, S. B. Squires Co., S. F.; W. S. Berry, Western Electric Co., S. F., and back up to the front of the picture again, R. F. Oakes, of the National Carbon Co., S. F. S. W. Peterson of the Stubbs Electric Co. was there for dinner all right, but just doesn't happen to be in the picture.

None less than the widely famed Henri of the Benson Hotel of Portland, was the chief chef who prepared venison, trout and other such joys to the pink of perfection. Then there was target shooting, a game of cards now and then, frequent long but not business conferences on the porch, fishing trips along the McKenzie, hunting expeditions into the mountain tops, a late novel now and then, and a stunt to be staged or laughed at every few hours.

THE START

The Northerners met the San Franciscans at Eugene and motors were taken from here to Squaw Camp. From left to right they are as follows: W. S. Berry, C. M. Will, R. F. Oakes, H. E. Sanderson, C. R. Bach, C. C. Hillis, Rudy Prayle and C. E. Wiggin.

OFF FOR THE WILDS

There is a story of a fishing and hunting trip which turned out a real roughing-it party with over a twenty-four hour scarcity of food. From left to right the mountaineers are: Bill Deming, C. R. Bach, R. F. Oaks and the guide.

New Members of Federated Engineering Societies Announced

The Joint Conference Committee of the A. S. C. E., A. I. of Mining and Metallurgical Engineers, the A. S. M. E. and the A. I. E. E. announce members to the Federated American Engineering Societies, as follows:

American Institute of Chemical Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Agricultural Engineers and the Society of Industrial Engineers, as well as the Alabama Technical Association, Detroit Engineering Society, Engineering Association of Nashville, Engineering Society of Buffalo, Florida Engineering Society, Kansas Engineering Society, Technical Club of Dallas, The Cleveland Engineering Society and the Engineering Society of York.

Also the Grand Rapids, Kansas and Louisiana Engineering Societies, the Mohawk Valley Engineers' Club, Washington Society of Engineers and the Associated Engineers of St. Louis. The Iowa and the Florida Engineering Societies are to be ratified at the coming annual meeting.

Does it take six days for the newly painted floor to dry?

MAKE IT AN ELECTRICAL CHRISTMAS WITH AN ELECTRIC FAN

Executive Committee, N. E. L. & P. Association

The Executive Committee of the Northwest Electric Light and Power Association met in Portland, October 14, and carefully considered the report of the Advisory Committee presented at the Spokane Convention, and further details concerning the formation and objects of the Northwest Electric League were presented by members of the Advisory Committee.

It was the unanimous opinion of the Executive Committee that the Northwest Electric Service League can be the medium for closer cooperation of all branches of the electrical industry in the Northwest and that such cooperation will result in better service to the public, greatly increased use of electricity and electrical equipment, and the adoption by all elements of the industry of sound, ethical and progressive business methods.

Congratulations to the A. S. M. E.

The following telegrams of congratulation which were received by W. W. Hanscom, president of the San Francisco Section A. S. M. E., at the recent fortieth anniversary celebration, show that the leaders of this country realize that the engineer is the backbone of our civilization and appreciate the value of this organization, the American Society of Mechanical Engineers.

Permit me to extend greetings to your organization and its members throughout the country, and indeed the world, on the fortieth anniversary of your founding. In few directions has America so emphatically demonstrated continued leadership as in engineering. Wherever there have been great problems of construction and development requiring the genius to dominate or to subjugate the forces and materials of nature, there the talents of the American engineer have been in demand. The modern world owes a debt to your profession that can never be overestimated, a debt that in the great period of reorganization, rehabilitation and advancement which now opens before us will be further increased. Please accept my congratulations on the anniversary of your society and best wishes for your continued prosperity and for the expansion of your world-wide field of opportunity and usefulness.

(Signed) WARREN G. HARDING.

Combination mechanical science from our two great countries ought to be bright example to world.

(Signed) ASPINWALL,
Honorary Member, London.

American engineers in Cuba offer congratulations, fortieth anniversary. Atlanta Section sends greetings. Congratulations on your Section's growth. (Signed) METROPOLITAN SECTION.

Heartiest greetings on occasion fortieth anniversary. Events recent years which demonstrated importance of engineers to civilization and established their power in industrial world indicate necessity for continued expansion of engineering societies' activities.

(Signed) INSTITUTION OF MECHANICAL ENGINEERS
OF LONDON.

No creation of wealth can be termed civilization unless coupled with high ideals. These are urgently needed for next move of civilization which is awaiting results of the efforts of engineers uniting with and doing service for the community. (Signed) DE FREMINVILLE,
Honorary Member, Paris.

As president of the American Federation of Labor, it is my firm conviction that the labor movement not only welcomes but invites your cooperation. (Signed) SAMUEL GOMPERS.

Institution Civil Engineers, London, congratulate American Society of Mechanical Engineers on fortieth anniversary and on their leadership in industry.

Greetings. Forty years of achievement by the engineer has produced a mechanical age greater than that of all time combined and is a challenge to the present generation that calls forth our best endeavor; therefore we accept the responsibility and pledge ourselves to become better engineers, better citizens with better ideals rendering unselfish service to humanity.

(Signed) PRESIDENT-ELECT E. S. CARMAN.

The greatest constructive work before the engineers of the United States is the creation of a sense, mutual between employer and employe, to apply the same skill to development of the human side of our employment relations that we have devoted to our machines and our processes. Our engineers stand midway between the employer and employe in intimate contact with both. It is the engineer's problem, and I consider the very fact that your meeting is devoted to its consideration is a step into a field of engineering that is more fundamental to our material welfare than any other issue before our country.

(Signed) HERBERT HOOVER,
The American Society of Mechanical Engineers.

Greetings from the Commonwealth of Massachusetts to all celebrating the fortieth anniversary American Society Mechanical Engineers. We were always supported heartily in civic works by your society and know that further support will increase rather than lessen. With best wishes for each and every one, (Signed) CALVIN COOLIDGE.

Congratulations to society on its fortieth birthday. City of Boston appreciates assistance of engineers in municipal problems.

(Signed) ANDREW J. PETERS, Mayor.

Boston Section and Dean Anthony Tufts College send greetings.

Greeting and best wishes from the St. Louis Section. We hope that the spirit of the anniversary celebration may join us all closely into one unit, advancing irresistibly toward national progress for the benefit of mankind. (Signed) ST. LOUIS SECTION, A. S. M. E.

(Continued from page 518)

This will be possible too in most of the sections when the new Kings River plants are brought into the line at Sanger and the new steam plant at Button Willow is constructed and the line looped through it, because the supply points will be so distributed along the line that sections can be taken out without separating a substation from one of the other sources of supply. It is possible, therefore, to maintain practically continuous service even though replacements will become necessary at some future time.

Calculating Transmission Line Economies

In methods of making calculations of transmission line economies, practically all writers agree on considering the conductor only, or rather that the price of conductor is the only variable in the equation. This may be true where tower lines on private rights-of-way are considered, but where transmission lines on single poles along public highways are considered, it seems that the cost of supports must also be a variable. The 110-000-volt line described in this paper shows the lowest factor of safety against horizontal loads and if the size of the conductor were increased and the length of spans left the same, the line would be weak against horizontal loads. The supports must be spaced more closely or a different type must be used. Closer spacing means more insulators and the cost per mile of the line would show a much greater increase than that caused by the increased size of the conductor alone. "A" frames or "H" frames could be used, and would keep the number of insulators down, but this would require at least one of the poles of the frame to be placed on private property and the right-of-way question is immediately raised.

In making the economical calculations for this line, estimates were prepared on the costs of one mile of line using different sizes of aluminum conductors and varying the pole spacing in line with the discussion just given. Then the annual charges per mile of line were calculated on the basis of 9% interest, 4% depreciation and 2% maintenance and the results plotted against the annual cost of the power lost per mile of line at 5.25 mills per kw-hr. Then according to Kelvin's Law the line which shows an annual charge equal to the annual cost of power lost, or in other words, the line indicated by the crossing of the curves of annual cost and the power lost for the given load, is the most economical line. It will be noted from the curve sheet here shown that with an aluminum conductor of 266,800 c.m. cross section, the economical load is 20,000 to 21,000 kw. at 100% load factor and a power factor of 85% lag, which is roughly the same as 30,000 kw. at a 70% load factor. The critical disruptive corona voltage for that size conductor at sea level at a temperature of 120° F. is approximately 130,000 at a spacing of ten feet between conductors. It was then chosen as being the most economical conductor for the load as well as being safe from corona at the operating voltage of 110 kw.

LATEST IN EVERYTHING ELECTRICAL

(A year ago who would have thought of going to the electrical contractor-dealer for a manicure set? Yet here it is, all nicely electrified and ready for the market. Other products of the West presented on this page are two new ironers, one being manufactured in Seattle and the other in Chicago. The water powers of British Columbia and the new Who's Who, reviewed from a Western standpoint, are among the books and bulletins presented here.—The Editor.)

ELECTRIC MANICURING

The Electric Manicuring Company of Los Angeles has recently been incorporated for the purpose of manufacturing and selling an Electric Manicuring Set.

The outfit consists of a small Westinghouse electric motor, attached to which is an adjustable shaft, and to this a circular file, cuticle point, emery

The new electrified manicure set

board and buffer can be attached as needed. By use of a quickly detachable tool attachment, it is not necessary to stop the motor to change the tools.

The manufacturers state that by this method a manicurist can accomplish three times as much in a day as by the present method.

THE "UNIVERSAL" CLOTHES WASHER

A washing machine which combines unusual features of mechanical construction, safety and appearance is being placed on the market by Landers, Frary & Clark of New Britain, Connecticut. This covers a floor space 24 by 30 inches with a tub 36¼ inches and weighs 285 lbs. Its manufacturers state that this machine combines the advantages of the revolving and oscillating type.

NEW IRONER IS AUTOMATIC

The new Thor Electric Ironer is described by the manufacturer, the Hurley Machine Co., as representing a new mechanical departure in electrical home labor saving appliances.

A touch on a small lever, placed on the feed board, throws the shoe into gear with the motor and the shoe moves into one of three open positions or into the closed position, as the operator may desire. Two buttons placed on the control lever are shifted up and down according to the position into which the shoe is to be moved, leaving the hands free to guide the pieces being ironed.

The roll is given two speeds, one a standard speed of eight feet per minute for heavy pieces, and the other a 12½-ft. per minute speed for handkerchiefs, towels, and other light pieces.

SPARTAN VACUUM CLEANER CONNECTOR

Manufacturers of electric vacuum cleaners have experienced some difficulty in obtaining devices which are best suited for connecting the wires from motor to the switch connection at the lower end of the handle. To meet this need, the Bryant Electric Company of Bridgeport, Conn., offer the Spartan Receptacle—handle connector No. 138.

Connector Cleaner

A heavy fibre tube which is longer than the porcelain connector body is provided to insulate the binding screws or wire terminals from the handle. The body of the connector is provided with contact slots for plug caps and binding posts for wires which are staked and riveted. This connector is 1⅜ in. long by ⅞ in. diameter, with a slight flange 1 3/16 in. diameter to hold the device at the end of the handle.

MERCER IRONING MACHINE

The Western Appliance Manufacturing Company, Seattle, maintaining offices in the Railway Exchange Building, recently began the construction of a factory wherein will be manufactured the Mercer Ironing Machine which, in the opinion of its inventor and manufacturers, is destined to take its place among the leading machines of its kind now on the market. It has such features embodied in its general construction as an ironing shoe opening a total of six inches from the roll. The transmission consists of a belt drive to a worm gear which in turn revolves the roll together. Sufficient machinery for the manufacture of 500 machines per month is on the ground and will be installed as soon as the factory is completed.

Books and Bulletins

Water Powers of British Columbia

This comprehensive report of the Canada Commission of Conservation compiled by Arthur V. White, consulting engineer with the commission, is a summary of all data relating to the water-power resources of British Columbia.

The principles which should govern in the conservation and utilization of inland waters and a complete compilation of stream flow and meteorological data on the more important streams of British Columbia make up the major portion of the book. A survey of water legislation in the Province adds to the value of the bulletin as a handbook on the power situation of Western Canada. Views of the beautiful rivers, lakes and falls of British Columbia make the report of unusual interest.

Who's Who in America—1920-21

The eleventh biennial issue of Who's Who in America, now being distributed, contains 23,443 biographical sketches of leading living Americans, 2,514 of which did not appear in the previous edition. As usual, the latest address is appended to each sketch and the index by state and post office address is retained.

The following Western engineers have been added this time to the list of Westerners which appeared in previous issues: Stanly Easton, manager Bunker Hill & Sullivan Mining & Concentrating Company; S. M. Kennedy, vice-president and general agent Southern California Edison Company; R. H. Ballard, first vice-president Southern California Edison Company, and P. M. Downing, vice-president in charge of electrical construction and operation, Pacific Gas & Electric Company.

For the Mine

The extent to which electricity can be used in the mining industry is forcibly brought out in a recent publication

One view of a typical mining district covers the front and back covers of this recent C-H publication.

of the Cutler-Hammer Manufacturing Company which appears under the title "For the Mine." The applications presented with the aid of illustrations appear under the following headings:

Motor Controllers for Direct Current Service; Motor Controllers for Alternating Current Service; Accessories; Battery Charging Equipment for Miners' Lamps and for Battery Locomotives; Brakes—Electrically Operated; Iron-Clad Solenoids; Magnetic Separators; Magnetic Clutches; Electric Space Heaters and Electric Soldering Irons.

New Pelton Bulletin

A complete diagram of the typical installation of a Pelton Pump in a Pit appears on the first page of the new Bulletin No. 11A of the Pelton Water Wheel Company. Following this is a page illustration which shows the structure of the Type B Centrifugal Pump and later some rating tables of interest to any who have to do with this type of machinery. A diagram showing the use of an automatic float switch and a plan for an irrigation plant also go to make this a noteworthy publication.

NEW ELECTRICAL DEVELOPMENTS

(The erection of several large industrial plants which will be noteworthy consumers of electricity is reported from the Northwest and also from the Pacific Central District. From Arizona come plans for completing the survey for the Colorado river basin project while Southern California reports the opening of a new power plant and the erection of two large factories. Items concerning the extension of power company distribution and generation systems predominate among those from the Intermountain district.—The Editor.)

THE PACIFIC NORTHWEST

REEDSPORT, ORE.—The town of Reedsport is contemplating the purchase of the plant and distribution system of the Reedsport Light & Power Company.

OLYMPIA, WASH.—The Northwestern Electric Company, with main offices in Portland, Oregon, has increased its capitalization in Washington to $22,000,000.

MARSHFIELD, ORE.—The Marshfield Mill & Timber Company's new electric mill is now in full operation. It is the only complete electrically operated mill in Coos county and is cutting 20,000 feet of lumber a day.

SALEM, ORE.—The Pacific Telephone & Telegraph Company has filed application with the Public Service Commission of Oregon, for a general increase in rates on its various properties throughout the state.

SEATTLE, WASH.—The Power Plant Engineering Co., a new corporation, has been capitalized at $25,000, and will engage in a general engineering, constructing and manufacturing business in Seattle.

ELMA, WASH.—The Public Service Commission has suspended the proposed increase in rates of the Northwest Electric & Water Company for a period of 90 days pending a hearing. The company operates in Elma, Montesano, Satsop and intermediate points.

SALEM, ORE.—A total of 88 permits covering the use of water for irrigation of approximately 3400 acres of land and the development of 540 hp. were issued by State Engineer Cupper during August and September, according to a summary.

ASHLAND, ORE.—Harry Silver, manager of the Pompadour Mineral Springs, has recently closed a contract for the erection of a plant which will liquidate natural carbonic gas and sell the product in the East. The company has a capital stock of $25,000.

TACOMA, WASH.—City officials feel that the Lake Cushman power site must be acquired since the demand for power has been beyond the limit of the La Grande power plant of the city. This increased demand is largely due to the increased growth of the city.

TACOMA, WASH.—The city council has approved plans of the Light and Water department for a supply, warehouse and shop building. The proposed structure will be 200 by 100 ft., of reinforced concrete construction, two stories in height. The cost will approximate $75,000.

SEATTLE, WASH.—Contractor D. G. Lebb and his assignee, J. A. Harris, both of Portland, Oregon, recently filed a $50,000 foreclosure lien suit in the Lewis county court at Chehalis, Wash., against the Sherman County Light & Power Company, a subsidiary of the Washington-Idaho Water, Light & Power Company.

HOQUIAM, WASH.—A large paper mill may be built in the addition of Woodlawn. By utilizing waste materials power will be furnished and raw materials for the mill would be secured for several years from the logged off land in this vicinity. Water for the plant would have to be brought from the East Hoquiam river in a viaduct.

TEKOA, WASH.—The termination of a controversy over the light and power franchise under which the Washington Water Company operates its system in Tekoa came to an end when the company submitted a complete subrogation to the terms of the franchise. Definite action will be taken by the council at its next meeting.

TACOMA, WASH.—The business of the municipal light department for the month of October, 1920, showed an increase of 64.2 per cent over the same month of 1919, according to statistics filed by the department. This was exclusive of power sold the nitrogen plant at La Grande, and represents the tremendous growth in the use of electricity by the growing city of Tacoma.

SEATTLE, WASH.—Mayor Caldwell, in a letter to the city council, recommends the sale of the $600,000 Skagit River bond balance to the highest and best bidder, rather than by the plan of selling the bonds over the counter in small lots. About $360,000 of the securities have been sold in this way. The balance remaining will be needed next month to further finance the development at Skagit River.

HOOD RIVER, ORE.—Application has been filed with the Federal Water Power Commission at Washington by the Columbia Valley Power Company, for a permit for power to develop the Deschutes river. New York capitalists are behind the project and it would seem that they are making definite plans for the development. It is estimated that the power sites are capable of producing 380,000 hp.

AURORA, ORE.—The main offices of the Mollalla Electric Company will be moved from Canby to Aurora, according to announcement made by E. G. Robinson, manager of the company. The move is being made to Aurora as it is a more central point since the Mollalla company has been purchasing power from the Portland Railway, Light & Power Company at Woodburn.

PORTLAND, ORE.—The Portland Vegetable Oil Mills Company, capitalized at $1,000,000, will soon commence the erection of a plant in Portland, which will have a capacity for crushing 100 tons of copra (dried cocoanut) a day. This will require the importation of copra having a value of more than $4,000,000 a year, and a value of finished product of over $6,000,000 a year. The mill will be electrically operated throughout.

SEATTLE, WASH.—According to William Tupper, president of the Tupper Manufacturing Company of Seattle, this plant, which was established something over a year ago, is now turning out 10 electric dishwashing machines daily. The company specializes in the manufacture of dishwashers of all sizes, and according to Mr. Tupper is having a hard time to keep up with the orders received.

YAKIMA, WASH.—A total of nearly a million dollars is being spent in canal and drainage improvements in Yakima valley this year despite reports that the project is at a standstill. The Indian reclamation service is spending the bulk of this in distributing the $475,000 appropriated by Congress, but in addition to this, six of the larger canal companies are spending from $10,000 to $30,000 in betterments, and the county a total of $344,000 for its drainage program. The various projects comprise an area of about 40,000 acres.

SALEM, ORE.—The Fort Klamath Meadows Company, of Fort Klamath, through the law firm of Ferguson & Fletcher of Klamath Falls, recently applied to State Engineer Percy A. Cupper for a permit to appropriate 70 second-feet of water from Anna creek, tributary to Wood river, to be used in developing power. A dam of concrete five feet high and 20 ft. long, with wasteway over the center, will be constructed. Plans also call for an iron headgate with screw lift gate five feet in diameter, set in concrete; 10,100 ft. of pipe; a Pelton water wheel and a dynamo. The total cost is estimated at $50,000.

THE PACIFIC CENTRAL DISTRICT

OAKLAND, CAL.—The lease of land for a new six-minute automobile ferry has been ratified.

REDDING, CAL.—The Pacific Gas & Electric Company is going to spend approximately $20,000 to give Redding a better water supply and safer fire protection.

OAKLAND, CAL.—A building permit has been issued for the construction of a $40,000 concrete garage on the north side of Hobart street, 175 feet west of Broadway.

FRESNO, CAL.—Power users of the San Joaquin Valley have been assured by the San Joaquin Light & Power Corporation that more than 3,000 new extensions will be made to take care of applications for power.

OROVILLE, CAL.—The Frieseley Air Craft Corporation has started the construction of its large manufacturing plant near Gridley. It is planned that the plant will be one of the largest airplane plants in northern California.

MODESTO, CAL.—A block of $505,000 worth of Don Pedro project bonds will be placed on sale by the Modesto district and a $2,570,000 block by the Turlock district, at 2 p.m. on the afternoon of December 14.

OAKLAND, CAL.—Plans for Oakland's proposed combined state armory and exposition building were outlined recently at a meeting of representatives from the Merchant's Exchange, Chamber of Commerce and National Guard organizations with the mayor.

FRESNO, CAL.—Anticipating the fast growing needs for big material, the California Peach Growers have closed a contract with the government by which it acquires timber amounting to 60,000,000 ft. In addition the company has also purchased $10,000,000 ft. from the Yosemite Power Company's plant.

FRESNO, CAL.—Building operations amounting to nearly half a million dollars, in which the California Peach Growers are interested, have been announced by the general manager of that company. This total includes the joint construction of a $200,000 office building with the California Associated Raisin Company.

RICHMOND, CAL.—The coming of a $1,000,000 manufacturing corporation with Eastern connections and the sale of $150,000 in harbor bonds for immediate construction of another unit of the Richmond city terminal on the inner harbor are announced as items which tend to show the rapid industrial growth of this city.

VISALIA, CAL.—Bids will be opened on December 16 by the Tulare County Board of Supervisors for a natural gas franchise for this county. An application for such a franchise was formally presented to the board by F. A. Cleveland, representing a syndicate owning extensive gas wells in the Tulare Lake region. The syndicate expects to supply the towns of Tulare and Kings counties with the natural fuel.

STOCKTON, CAL.—Private individuals have made application for use of part of the natural flow of the north fork of the Stanislaus river. It is contemplated to erect a power plant at the headwaters of the river to develop about 9,600 horsepower, involving an expenditure of $2,000,000.

SUNNYVALE, CAL. — The Federal Paulson Construction Company will erect a large wireless station about 1500 feet away from the port of Sunnyvale. The cost of the plant will aggregate $160,000. The foundation is to be laid soon, the steel framework being already on hand for the superstructure.

MARTINEZ, CAL.—The Petroleum Products Company has announced that it obtained from the supervisors of Contra Costa county a twenty-year lease for a wharf franchise at Oxol, Carquinez Straits, between Port Costa and Martinez, for its new refinery. An application is before the Railroad Commission for utilization of the pier.

WILLOWS, CAL.—According to the weekly record of deeds published, several rights-of-way have been granted to the Mt. Shasta Power Company. This company, a branch of the Pacific Gas & Electric Company, will erect a steel tower line from Pit river to the coast. In its course it will run through the western part of Glenn county.

SAN FRANCISCO, CAL.—The establishment of a large brick factory in San Francisco within the early future by the International Bricklayers' Union to meet the dual purposes of reducing building costs and increasing the use of brick as a construction material, has been announced. The plant contemplated will cost in the neighborhood of $250,000.

RICHMOND, CAL.—The manufacturers' bureau of the Richmond Chamber of Commerce will take up with the San Francisco-Oakland Terminal Railways Company the proposition of extending the Eighth Street line out through the factory district, and as far as the Giant Powder Works at Giant. There are 1000 employes of factories in the northern section of the city not being served by any car line at present.

SACRAMENTO, CAL.—The 15 per cent surcharge which the Pacific Gas & Electric Company added to its arc lighting bills, and which the Great Western Power Company added to the "stand-by charge" for stringing a line to the City Sump, are legal charges against the city. This was the opinion which has been given to the City Commission by City Attorney Robert L. Shinn.

SAN FRANCISCO, CAL.—A recent order of the Railroad Commission, following an investigation of the practices of the Sierra and San Francisco Power Company as to extensions for electric service, directs the application of the rules of the Pacific Gas & Electric Company to the Sierra properties. The properties of the Sierra Company are now operated under lease by the Pacific Company.

RICHMOND, CAL.—With the news that the Santa Fe Railroad is to resume its ferry operations between this city and San Francisco on December 5, the information has been secured that the branch line of the road between Richmond and Oakland is to be electrified. For some time the head officials have been securing bids on the cost of making this important change, and contracts for the work are to be awarded in a short time.

SAN JOSE, CAL.—The water conservation survey in Santa Clara Valley is progressing favorably with several expert engineers in the field. All the irrigation wells are being mapped; some hundreds of them have been selected as observation wells; water levels from side to side and end to end of the valley are being ascertained, and possible reservoir sites on several local streams located. It will be four or five months before the final reports of the engineers will be made.

THE PACIFIC SOUTHWEST

SAN DIEGO, CAL.—A $500,000 gypsum company has been organized to develop huge deposits in Imperial Valley.

PRESCOTT, ARIZ. — An ornamental street lighting system is being planned. Single globe standards will be used, nine of these to be built in each block at 100-ft. intervals.

LOS ANGELES, CAL. — The Sunset Glass Manufacturing Company will start the construction of a new plant here at an early date. It is estimated that the expenditure made by the company will involve $250,000.

EL CENTRO, CAL.—Break-downs and interruptions in power and light supply for Imperial Valley consumers were declared to have ended with the completion of the Holton Power Company plant here under direction of Frederick Stierel, an Eastern expert.

SAN BERNARDINO, CAL.—A storage battery factory is being contemplated for this city, for the manufacture of a new type of automobile battery based upon patents that have been secured by W. L. Gill. The output of the factory is to be 500 batteries per month. Capital stock, $60,000.

CASA GRANDE, ARIZ.—Committee work in the development of the plans for establishing the San Carlos Power District is going forward steadily. The legal problems naturally arising in such cases are being carefully considered by competent authorities and further figures are being worked out relating to the mechanical side of the proposition.

YUMA, ARIZ.—The report of A. P. Davis, director of the United States reclamation service, on the tentative Boulder canyon project on the Colorado river basin, has been sent from here to Washington and will be presented to Congress December 6. The boards of directors of the Coachella Valley Water Users' Association and the Imperial Irrigation System have agreed to raise the $40,000 necessary to complete the survey. It is estimated that the entire project will cost at least $75,000,000.

LONG BEACH, CAL.—Roalfe & Purington, construction engineers, have been awarded the contract for a half-million dollar irrigation enterprise in Arizona. The owners of 10,000 acres and water rights involved in the project are mostly former Santa Fe Railroad men, who have organized a syndicate known as the Walapai Land & Irrigation Company. Construction of a dam near Hackberry and the building of between 18 and 20 miles of canals are details of the undertaking. The main body of land to be reclaimed is near Kingman.

PHOENIX, ARIZ.—The Hoeppner Electric and Machine Company has been given the largest electrical contract ever known in Arizona, and probably in the whole Southwest. This was the contract for wiring and the installation of motors and electrical fixtures of every description in the new Arizona Packing plant, the work of which is now just being completed after extending over a period of several months. The work included wiring, placing of conduits, and installation of switchboards and lights, as well as of electrical motors, 66 in number, and having a combined capacity of approximately 1000 hp.

THE INTER-MOUNTAIN DISTRICT

ST. GEORGE, UTAH.—The Dixie Power Company has completed its line to Silver Reef and electric power is now being used to hoist the ore from the mines in that district.

BOISE, IDA.—Application has been made by the Idaho Power Company to the public utilities commission of Idaho, asking that a date be set for its hearing on the valuation of the company's physical property.

EUREKA, UTAH. — Extensive improvements are being made in the street lighting system in Eureka. The plan recently adopted by the city council is to increase the candle-power of each, and to discard the old style incandescents.

FILLMORE, UTAH.—Preliminary plans are under way by the Telluride Power Company to extend its power line from Fillmore through the artesian well belt, on to McCormick and thence to Delta and other towns in that territory.

SALT LAKE CITY, UTAH.—Bids are being requested by S. Q. Cannon, city engineer of Salt Lake City, Utah, covering the installation of about one mile of additional street lights to correspond to the ornamental system installed there in 1919. The present system covers five-eighths of a mile of down town streets.

SALT LAKE CITY, UTAH.—Application has been made by the Utah Power & Light Company to the public utilities commission of Utah, for a certificate of convenience and necessity to extend its lines for furnishing light, power and fuel service to the new mill of the Utah Consolidated Mining Company in Tooele county.

PROVO, UTAH.—F. W. C. Hathenbruck, of Provo, in an application filed with the state engineer, proposes to develop six second-feet of water from the subsoil or subterranean flow in Slate canyon, Utah county, and to harness the flow to operate a 300-horsepower hydroelectric plant with which to mine on Slate placer claim No. 1 at Provo.

NEPHI, UTAH.—The Big Springs Electric Company of Fountain Green is negotiating with the town of Levan in regard to extending its lines to that town. The company is now figuring on building a line down Nephi canyon, and through the valley to Levan if the necessary franchise can be obtained and arrangements can be made to finance the proposition.

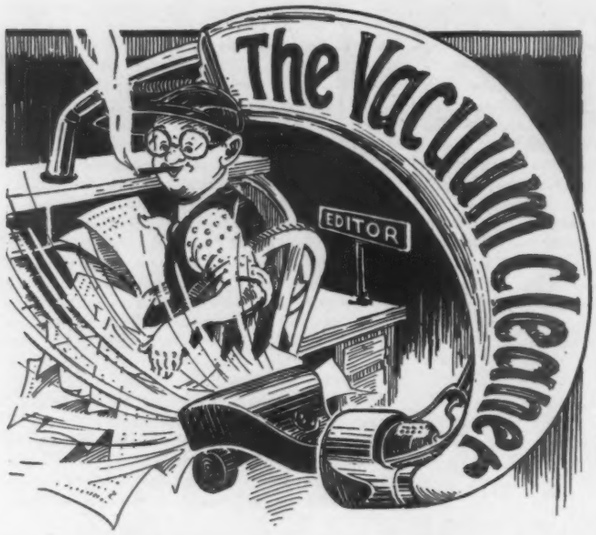
GOLDEN, COLO.—E. A. Phinney, president of the Jefferson County Power & Light Company, appeared before the city council at its recent meeting and discussed the matter of an application for an extension of the company's franchise in this city for a term of 20 or 25 years. The present franchise of the company has some time yet to run, not expiring until January 4, 1924.

ELKO, NEV.—Extraction of high-grade petroleum from shale is proceeding two miles from Elko, where the experimental distillation plant of the Catlin Shale Products Company is in operation. The material treated is yielding fifty gallons of high-gravity oil to the ton of shale, from which gasoline, paraffin wax, ammonium sulphate and producers' gas are extracted. No attempt is being made at present to market the crude oil.

DAYTON, NEV.—The all-steel dredger of the Gold Canyon Dredging Company, which was described recently in the Journal of Electricity, is handling approximately 5,000 cubic yards of gravel daily and digging to a depth of twenty to twenty-five feet. The material at present worked is stated to average 25 cents to 30 cents per cubic yard and the electrically operated and partially electrically welded goldship is reported to be earning excellent profits.

EUREKA, UTAH.—The electric power line to the new shaft of the South Standard Mining Company has just been completed and all the transformers have been installed. All the machinery has been moved over to the new shaft and the material for the foundations is also on the ground, the excavating having been completed some time ago. It is understood that an extensive campaign of development work will be carried on at this property during the fall and winter.

FLORENCE, COLO.—Judge Bell of Denver and W. B. Riley of Colorado Springs, representing the State Industrial Commission, were in Canon City recently and heard the application of the employes of the Arkansas Valley Light and Power Company to have a stipulated sum of money paid them by the company instead of the bonus which they have been receiving for the past four years, which was based on the saving they were able to make in the use of coal at the company's Canon City plant.



Business records are not always as helpful as they are thought to be. A northwestern power company recently had occasion to go through some musty records, and among entries in its books, encountered the following items.

"One donkey employed clearing camp site together with thirty other men.
"Two series transformers for gump pump.
"One old man (badly bent).
"Twelve small teeth for hack saw blade.
"Six gazzizzas.
"Two dead men seven feet long.
"Labor on proposed alterations.
"One sceptic tank.
"One snow pump.
"Labor on meaters.
"Two serious transformers.
"Twelve indecent lamps."

* * *

A new industry seems to be indicated by a sign we saw recently:

"We use customers' own skins in making up furs."

* * *

A firm hand is necessary in some branches of the export business, judging by a recent trade announcement reading:
"British concern offers prompt shipment of refractory goods."

* * *

Banking has some "unexpected angles," according to a recent speaker. He was probably thinking of the colored lady who walked into the bank one day and planking down the savings of several years, remarked:

"Ah wants you should take care of dis yeah cash fo' a while."
"Why, Chlorine," ejaculated the teller, who knew her of old, "I thought you always said you'd never trust the bank."
"Dat's all right, dat's all right; but de circumferences surroundin' de matter makes me change mah mind. Yo' see, I'se gwine get married an' Ah don't want dat much money round de house with no strange cullid man on de premises."

* * *

Parliamentary procedure sometimes leads to action, apparently. We find the following in the minutes of a recent meeting:

"Proposal No. 19
Waiting Period

Mr. Jones moved to lay on the table till next meeting."
—from which we gather that Mr. Jones was forcibly prevented from passing the time between the two meetings in his own way.

Telegraphy has its disadvantages. A sailor summoned for assault was asked by the patrol office why he struck the telegraph operator. He replied:
"Well, sir, I gives him a telegram to send to my gal, an' he starts readin' it. So, of course, I ups and gives him one."

* * *

At first sight the following trade announcement looks bad:
"A manufacturer in Argentina is in need of veterinary drugs and remedies, motors and lighting sets to operate on alcohol." Industry seems to be rather unhealthy down there;—going to the dogs, in fact.

* * *

The education of the public has ever been one of the planks in the electrical industry's platform. As a shining example of this spirit we quote the story of the sweet young thing who was being shown through the Baldwin locomotive works. "What is that thing?" she asked, pointing with her dainty parasol.
"That," answered the guide, "is an engine boiler."
"And why do they boil engines?" she inquired again.
"To make the engine tender," politely answered the resourceful guide.

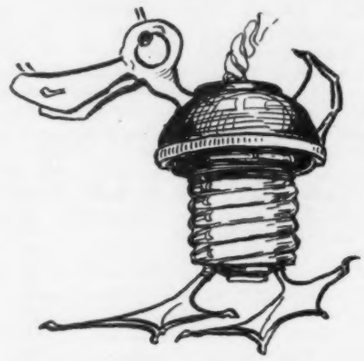
* * *

Preparedness is not necessarily synonymous with safety. Witness one Pat Murphy who, when asked what was bulging in his vest pocket, replied:
"Dynamite. I'm waitin' f'r Casey. Every toime he meets me he slaps me on th' chist an' breaks me pipe. Next toime he does it he'll blow his hand off."

* * *

Einstein's theory of relativity, or some similar obsession, must have been afflicting a certain young city salesman who was traveling through the mountains of Virginia. On the top of a divide he met the star-route mail-carrier.
"What time is it?" he asked.
Pulling out his watch, the mail-carrier replied:
"It's three o'clock by railroad time."
"By railroad time!" said the young man. "It looks to me like you people 'way back here in the mountains would use sun time!"
"What for, young man? We are a damned sight closer to the railroad than we are to the sun."

* * *



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